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# ANNUAL REPORT

OF THE

# MINISTER OF MINES

FOR THE

## YEAR ENDED 31ST DECEMBER

## 1927

BEING AN ACCOUNT OF

## MINING OPERATIONS FOR GOLD, COAL, ETC.

IN THE

## PROVINCE OF BRITISH COLUMBIA

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
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The Premier Mine. Photographic Study by H. Mortimer Lamb. Hung in Royal Photographic Salon, London, 1927.

*To His Honour* ROBERT RANDOLPH BRUCE,
*Lieutenant-Governor of the Province of British Columbia.*

MAY IT PLEASE YOUR HONOUR:

The Annual Report of the Provincial Mineralogist upon the Mining Industry of the Province for the year 1927 is herewith respectfully submitted.

W. H. SUTHERLAND,
*Minister of Mines.*

*Minister of Mines Office,*
*March 12th, 1928.*

5. author

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*To the Honourable W. H. Sutherland,*
*Minister of Mines.*

SIR,—I have the honour to submit herewith my Annual Report on the Mining Industry of the Province for the year ended December 31st, 1927.

The statistical tables give the total mineral production of the Province to date and show by Districts and Divisions the output of the various metals and minerals for the year 1927, and comparative figures for previous years.

The reports of the Resident Mining Engineers give much information about the progress of mining, development, and prospecting throughout the Province. The reports of the Inspectors of Mines cover fully coal-mining in British Columbia.

I have the honour to be,
Sir,
Your obedient servant,

JOHN D. GALLOWAY,
*Provincial Mineralogist.*

*Bureau of Mines, Victoria, B.C.,*
*March 12th, 1928.*

THE LATE HONOURABLE WILLIAM SLOAN.

The Honourable William Sloan, Minister of Mines for British Columbia for nearly twelve years, died on March 2nd, 1928, and with his passing the mining industry lost a true friend and the country an outstanding citizen.

His early life was spent in the Province of Ontario, where he was born, at the town of Wingham, on September 19th, 1867. As a young man he lived for several years at Shanghai, China, where his father, the late Dr. R. J. Sloan, had taken up his residence. Returning in 1887, Mr. Sloan three years later established himself at the City of Nanaimo, which was his home and which he served with unswerving loyalty, both in private and public life.

In 1896 Mr. Sloan was one of a party to set out on a prospecting-trip into the Yukon Territory. While there, gold was discovered. He was one of the first on the ground, staking No. 15, "Eldorado," Klondyke. It was the experience gained whilst in the centre of activity in this epochal phase of mining development of the Canadian North-west, together with his close association with the miners of Nanaimo, which gave him the sympathetic appreciation of the problems of the prospector and miner, so marked in later life.

He first entered public life by securing the Liberal nomination for the constituency of Comox-Atlin. He was elected to the Federal House in 1904 and again in 1908, resigning his seat in favour of the late Hon. Wm. Templeman. In 1916 he was elected to represent Nanaimo in the Provincial Legislature and the late Premier H. C. Brewster called him to the portfolio of Minister of Mines, which he held until his death.

The guiding principles of Mr. Sloan's long administration were the stimulation of interest in prospecting, the encouragement of the mine operator of limited means, the promotion of measures for the greater safety and health of the workers in coal and metal mines, and the protection of the good name of British Columbia as a field for mining investment by close investigation of all mining enterprises.

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# STATISTICAL REVIEW OF THE MINERAL INDUSTRY OF BRITISH COLUMBIA IN 1927.

By John D. Galloway, Provincial Mineralogist.

## GENERAL SUMMARY.

The year 1927 was again a prosperous and satisfactory one for the mineral industry of British Columbia. The gross value of the mineral production was $60,729,358, as compared with $67,188,842 in 1926, a decrease of $6,459,484, or 9.6 per cent.

While the value of the production was less than in 1926, this decrease is accounted for by lowered metal prices rather than to decreased output of minerals. That the actual production in the aggregate did not decrease is shown by the fact that the 1927 output, if valued at 1926 prices, would give a production value of approximately $1,000,000 greater than in 1926. Furthermore, the tonnage of ore mined amounted to 5,416,021 tons, an increase of 640,948 tons over the 1926 output—the previous record year.

All the larger mines of the Province maintained or increased the tonnage of ore treated, but a number of silver-lead-zinc properties decreased their output. In part this was due to lowered metal prices and partly owing to suspension of mining in order to construct concentrators and other equipment.

As compared with 1926, the production figures for 1927 show increased outputs of lead, zinc, and coal, and decreases in gold, silver, and copper. Owing to lower average metal prices the production values of all metals show decreases.

The output of structural materials was somewhat less than in 1926, indicating a slight lessening of building activity in the Coast cities.

The production of miscellaneous minerals showed a substantial increase over the 1926 figure.

Since mining commenced in the Province in 1852 the total mineral production has been $1,048,837,828, and over 50 per cent. of this has been produced in the last twelve years.

British Columbia leads all the Provinces of Canada in the production of silver, lead, zinc, and copper.

The mineral industry of British Columbia, in so far as production is concerned, may be divided into three classes—metal-mining, coal-mining, and the production of structural materials and miscellaneous minerals. Of these, the first is by far the most important, with a production for 1927 valued at $45,133,329 (including placer gold). This is followed by coal, with an output valued at $12,269,135, and structural materials and miscellaneous minerals totalling together $3,326,894.

By value, the various products of the mineral industry produced in 1927 are ranked in the following order: Lead, coal, copper, zinc, silver, gold, structural materials, miscellaneous minerals. The quantities of lead and zinc produced in 1927 were the highest in the history of mining in the Province. The copper-output practically equalled that of 1926—the previous record year.

Due to the steady expansion of the *Sullivan* mine in recent years, lead has easily maintained first place in the value of mineral products produced in the Province for the last four years. The British Columbia output of lead is now about 10 per cent. of the total world output and the present rate of production will probably increase.

In 1926 copper reached second place, having a value of nearly $700,000 greater than coal, but in 1927 coal resumed second place with an output valued at $12,269,135, as compared with $11,525,011 for copper.

Coal-mining has not been in a particularly flourishing condition in recent years, but the outlook now is better than for some time past. The production for 1927 showed a gratifying increase as compared with 1926.

The *Sullivan* mine is also mainly responsible for the increase in zinc production in the last three years, but other mines are also contributing in part. A larger production of zinc is expected in 1928.

The silver production of the Province is obtained from many mines, the two largest contributors being the *Sullivan* and the *Premier*.

The decline in the price of silver had some effect in retarding production in the Slocan district, where in many of the mines silver is the most important value in the ore. Approximately 80 per cent. of the silver production of the Province comes from mines in which the silver value is of less importance than the other metals, such as gold, copper, lead, and zinc, contained therein.

The production of gold (including placer and lode mines) in 1927 amounted to $3,835,848, a decrease of $683,514 as compared with 1926. The decline in lode-gold production of the last two years has been caused by the gradual exhaustion of the gold-copper deposits of Rossland and the closing of the *Surf-Inlet* mine. A number of gold properties are now being developed and the outlook is for the gold production to again increase within a few years.

Placer-gold production reached a low ebb in 1927 owing to a number of reasons, but exploration and development of placer properties was quite marked. Undoubtedly the placer-gold output should show some increase in the future.

## DEVELOPMENT.

As has been briefly outlined, the production record of the mineral industry during 1927 was quite satisfactory. The outlook for 1928 is also excellent and there is but little doubt that the aggregate output of metals and minerals will continue to increase.

During recent years increased production in British Columbia has been largely through greater outputs from existing mines, particularly the *Sullivan* mine at Kimberley. Some further increase in rate of output may be expected from some of the larger mines during 1928, but not to such an extent as during 1926 and 1927. The encouraging feature, however, is the amount of important development that has been carried on in many parts of the Province during the last three years. The results of this will become apparent by increasing the output of minerals during 1928 and ensuing years.

During 1927 a greater amount of development-work was carried on throughout the Province than in any previous year. Details of this work are given in the reports by the six Resident Engineers on their respective districts.

The two most active areas were the Portland Canal Division and the Slocan District, but in the aggregate a large amount of exploratory work has been done in varied and widely separated parts of the Province.

Many previously worked properties which had lain dormant for years are being reopened and actively developed. Many prospects and slightly developed properties have also been taken up by various companies.

The large mining companies were active in acquiring properties throughout the year and many new mining companies were formed for the purpose of developing mineral properties.

It is particularly interesting to note the aggressive policy of the Consolidated Mining and Smelting Company of Canada, Limited, in optioning and purchasing mineral properties. The annual report of this company for 1927 shows that nearly twenty properties were optioned during the year. After more or less exploration, a number of the options were relinquished, but on others further development will be carried out in 1928.

One tangible evidence of successful development in recent years was the construction of nine new concentrators during 1927. These were at the *Lucky Jim*, *Whitewater*, *Hewitt*, and *Ruth-Hope* mines in the Slocan District, at the *Paradise* mine in Windermere Division, at the *Dunwell*, *Toric*, and Duthie Mines properties in Northern British Columbia, and the *Pioneer* mine in Lillooet Division. The combined capacity of these mills will approximate 1,100 tons of ore a day.

At several other properties development has been advanced to the point where concentrators will probably be erected in 1928.

Prospecting during the year was normal and some discoveries have been reported which, on opening up, may prove of value. The present active campaign by the larger mining companies to acquire mineral properties and the rapid rate that many claims long located and lying dormant are being taken up should soon cause a revival in prospecting. British Columbia for some years has been fairly well supplied with promising prospects and when the stock becomes depleted through the present demand a new supply will undoubtedly be forthcoming.

## METALLURGICAL PLANTS.

Steady progress was made during 1927 in the metallurgical treatment of ore. The expansion of some of the larger mines in recent years has been in large measure due to the skill of the metallurgist. As a result, more efficient treatment of ore has been brought about and lower-grade ore is being handled.

Only a small percentage of the metallic ores of the Province is now being treated by direct smelting, as the concentration of ores has been found to be much more efficient. During the last three years the Granby Company at Anyox has gradually changed from direct smelting to concentration of the low-grade copper ore contained in the *Hidden Creek* ore-bodies. The concentrator is now handling about 3,500 tons of ore a day and only enough crude ore is smelted to maintain one blast-furnace in operation, chiefly in order to smelt the concentrates produced at the mill.

The beneficial effects of this change of practice are shown by the fact that the company is now treating lower-grade ore than ever before, and even with the prevailing low price for copper during 1927 the company has made a satisfactory profit.

At the mill of the *Britannia*, as a result of improved metallurgical practice, a substantial production of pyrite is now being made, which formerly went into the tailings and was lost. Experimentation was commenced in 1926 and during 1927 the recovery of pyrite by selective flotation proceeded satisfactorily, resulting in an output for the year of about 37,000 tons. By additions and changes the *Britannia* mill was speeded up during the year, so that now it is treating 4,000 tons a day.

The Consolidated Mining and Smelting Company of Canada, Limited, continues to lead in experimentation and research in the treatment of ores and metal products. The following excerpts from the annual report of the company for the year ended December 31st, 1927, show what is being accomplished:—

"*The Kimberley Concentrator.*—The ore-supply was satisfactory and of about the same grade as during 1926, although the zinc content was somewhat lower. The cost of concentration again shows a slight reduction; while the metal recoveries are again very much better than any previous work, recovering 6½ lb. more metal from a ton of ore of the same grade in 1927 than in 1926. The grade of both the lead and zinc concentrates was also improved, resulting in a considerable saving in freight charges and at the same time enabling the reduction plants to make lower costs and higher recoveries.

"*The St. Eugene Concentrator.*—This mill has been operated most of the year, only being shut down when short of power. The results of this operation have been remarkable. A fair profit can be made while operating on tailings as low as 3½ per cent. of combined lead and zinc. A coarse-crushing plant has been built at this mill in order to treat the old mine-dumps.

"*The Lead-smelting Plant.*—Perhaps the most noteworthy improvement in the metallurgical department is in the increased efficiency of the lead-smelting plant. This plant had reached a very high state of efficiency in 1925 and added to this in 1926. Early in 1927 the new Cotterell plant for roaster-fumes was put into commission. This plant is one of the most modern installations in existence. The estimates of savings by this plant have been very much exceeded; in fact, this treater has reduced the lead losses of 1926, which were considered as very low, to less than one-half that amount in 1927.

"*The Copper Smelter and Refinery.*—A reverberatory furnace has been installed and has been in operation for the last third of the year. This furnace will undoubtedly be an improvement on the blast-furnace for the ore available. However, it is too soon to say to what extent the costs and recoveries will be affected.

"*Research Department.*—As in 1926, the most important work carried on in this department has been in connection with the recovery of zinc-lead-silver and iron contained in the zinc-plant rejects and lead blast-furnace slags. A 1,500-kw. electric furnace has been in operation for several months and has demonstrated that these products can be treated profitably in an electric furnace.

"Four or five years ago some work was done on blowing powdered coal through molten lead blast-furnace slags. This work was discontinued because the electric furnace was considered more promising and because the Trail plant had no suitable coal-grinding apparatus.

"The mechanical difficulties in connection with electric smelting, the delicacy of the operation, and the fact that powdered coal was now available, together with rumours that the Anaconda Copper Company was having considerable success with the powdered-coal treatment at Tooele, caused us to resume research-work along these lines. This work promises to excel the electrothermic work on lead blast-furnace slags and possibly on zinc-plant rejects. It is expected that the process will be far enough worked out to build a plant to re-treat the current production of lead slag this year. Fifty tons of zinc will be recovered each day from this source.

"A plant for the recovery of cadmium from the zinc-plant residues has been built and this metal will be added to the list of metals produced by the company early in 1928. Tests on the value of triple phosphate are being carried out in the three Prairie Provinces in conjunction with the Provincial Agricultural Departments and the Canadian Pacific Railway. One hundred and eighty tons of triple superphosphate is being made from rock from the company's new phosphate-fields for this purpose.

"Research-work on antimony and bismuth indicates that these two metals will be recovered from the refinery by-products and marketed before the end of the year."

Much construction-work and enlargement of plant was carried out by the Consolidated Company, both at Trail and at the *Sullivan* mine. Steady progress was also made by the company's subsidary—the West Kootenay Power and Light Company, Limited—in installing the third hydro-electric plant of 60,000-horse-power capacity. This plant will be finished early in 1929 and most of the power will be required at the metallurgical works at Trail.

The construction or remodelling of nine concentrators was carried out during the year, five of these being in No. 5 District, two in No. 1 District, one in No. 2 District, and one in No. 3 District.

## METAL PRICES.

Metal prices generally in the world's markets in 1927 were considerably lower than during 1926. The following table shows comparative average yearly prices for the years 1925, 1926, and 1927:—

AVERAGE METAL-MARKET PRICES FOR 1925, 1926, AND 1927.

| Year. | Silver (New York). | Copper (New York). | Lead. | | Zinc. | |
|---|---|---|---|---|---|---|
| | | | London. | New York. | London. | St. Louis. |
| | Cents per Oz. | Cents per Lb. | Cents per Lb. | Cents per Lb. | Cents per Lb. | Cents per Lb. |
| 1925 | *69.065 | *14.042 | *7.848 | 9.020 | *7.892 | 7.622 |
| 1926 | *62.107 | *13.795 | *6.7513 | 8.417 | *7.4096 | 7.337 |
| 1927 | *56.37 | *12.92 | *5.256 | 6.755 | *6.1946 | 6.242 |

* Prices used in compiling total metal valuations in 1925, 1926, and 1927 Annual Reports.

The decline in average metal prices during 1927 as compared with 1926 amounted to 9.2 per cent. for silver, 22.2 per cent. for lead, 16.4 per cent. for zinc, and 6.35 per cent. for copper.

It is satisfactory to note that, notwithstanding these lower metal prices, mining in British Columbia was not in the aggregate curtailed during 1927.

The outlook for metal prices in 1928 is that no further heavy decline is to be expected. While some fluctuations will of course occur, it is probable that the yearly averages will hold up to about the 1927 level.

Copper would seem to be in a stronger statistical position than for some years; lead and silver should maintain their present position; while zinc is in a somewhat weak statistical position and as a consequence lower prices may prevail in 1928.

## PROFITS OF MINING COMPANIES.

The following table shows the dividends declared by companies engaged in the mineral industry in the Province during 1926 and 1927:—

| Company. | 1926. | 1927. |
|---|---|---|
| The Consolidated Mining and Smelting Co. of Canada, Ltd. | $5,234,700 | $6,358,875 |
| Premier Gold Mining Co., Ltd. | 1,600,437 | 1,601,250 |
| Howe Sound Co.* | 1,736.133 | 1,984,152 |
| Silversmith Mines, Ltd. | 200,000 | ---------- |
| Granby Consolidated Mining, Smelting, and Power Co., Ltd. | ---------- | 348,872 |
| *Bell* | 48,510 | 64,629 |
| Rosebery-Surprise Mining Co. | 25,000 | ---------- |
| Whitewater Mines, Ltd. | 25,000 | 10,000 |
| Belmont-Surf Inlet | 437,500 | ---------- |
| Crow's Nest Pass Coal Co., Ltd. | 372,690 | 372,760 |
| Clayburn Co. | 44,000 | 32,000 |
| Port Haney Brick Co. | ---------- | 20,000 |
| Others | 23,300 | 8,300 |
| Totals | $9,747,270 | $10,800,838 |

The amount of $10,800,838 shown above as distributed in 1927 by no means represents the total net profits earned during that year. In nearly all cases substantial sums are set aside from profits to the credit of surplus and reserve accounts. Profits accruing to private companies and individual mining enterprises as a rule are not given publicity as dividends, as is the case with the large companies, so that no record of these profits, which in the aggregate are considerable, is available.

* The Howe Sound Company is the holding company for the *Britannia* mine in British Columbia and the *El Potosi* and *Calera* mines in Mexico. Dividends paid by this company are therefore derived from the profits on operation of all three mines, so that only part of the dividends paid, as shown, can be credited to the *Britannia* mine.

# MINERAL PRODUCTION OF BRITISH COLUMBIA.

## METHOD OF COMPUTING PRODUCTION.

The total mineral production of the Province consists of the outputs of metals, coal, structural materials, and miscellaneous minerals, valued at standard recognized prices.

In the Annual Report for 1925 some changes were made in the methods used in previous years in computing and valuing the products of the industry; but in order to facilitate comparisons with former years the same general style of tables was adhered to. The methods used in 1925 were followed in 1926 and again in this Report.

The following notes explain the methods used:—

(1.) From the certified returns of lode mines of ore and concentrate shipments made during the full calendar year by the producers the net recovered metal contents have been determined by deducting from the "assay value content" necessary corrections for smelting and refining losses.

In making comparisons of production figures with previous years, it should be remembered that prior to 1925 in the Annual Reports the total metal production, with the exception of copper, was determined by taking the assay value content of all ores shipped; deductions for slag losses were made by taking varying percentages off the metal prices.

(2.) Gold-placer returns are received from the operators in dollars and the dollar value converted to ounces of placer gold at $17 an ounce, which is believed to represent the average value of placer gold throughout the Province.

(3.) The prices used in valuing the different metals are: For gold, the world standard price of $20.6718 an ounce; for silver, the average New York metal-market price for the year; for lead, the average London metal-market price for the year; for zinc, the average London metal-market price for the year; and for copper, the average New York metal-market price for the year. The silver and copper outputs of the Province are bought and sold on the basis of the New York metal-market prices of these metals and for this reason they are used. The bulk of the lead and zinc production of the Province is sold on the basis of the London prices of these metals and they are therefore used. The New York and Montreal lead- and zinc-market prices differ materially from the London prices of these metals and are not properly applicable to valuing the British Columbia production.

(4.) In 1926 a change was made in computing coal and coke statistics. The practice in former years has been to list coal and coke production (in part) as primary mineral production. Only the coke made in bee-hive ovens was so credited; that made in by-product ovens was not listed as coke, but the coal used in making this coke was credited as coal production. The result was that the coke-production figures were incomplete.

Starting with the 1926 Annual Report, the standard practice of the Bureau of Statistics, Ottawa, has been adopted. This consists of crediting all coal produced, including that used in making coke, as primary mineral production. Coke-making is considered a manufacturing industry. As it is, however, of interest to the mineral industry, a table included in the Report shows the total coke produced in the Province, together with by-products, and the values given by the producers. This valuation of coke is not, of course, included in the total gross value of mineral production of the Province.

(5.) Structural materials are valued at the prices given by the producers.

(6.) Miscellaneous minerals are valued at the market or the prices given by the producers.

## STATISTICAL TABLES.

TABLE I.—TOTAL PRODUCTION FOR ALL YEARS UP TO AND INCLUDING 1927.

| | |
|---|---|
| Gold, placer | $78,174,795 |
| Gold, lode | 130,651,919 |
| Silver | 86,689,046 |
| Copper | 221,492,079 |
| Lead | 121,850,734 |
| Zinc | 59,508,692 |
| Coal and coke | 296,968,268 |
| Structural materials | 51,115,811 |
| Miscellaneous minerals, etc. | 2,386,484 |
| Total | $1,048,837,828 |

TABLE II.—PRODUCTION FOR EACH YEAR FROM 1852 TO 1927 (INCLUSIVE).

| | | | |
|---|---|---|---|
| 1852 to 1895 (inclusive) | $94,547,241 | 1913 | $30,296,398 |
| 1896 | 7,507,956 | 1914 | 26,388,825 |
| 1897 | 10,455,268 | 1915 | 29,447,508 |
| 1898 | 10,906,861 | 1916 | 42,290,462 |
| 1899 | 12,393,131 | 1917 | 37,010,392 |
| 1900 | 16,344,751 | 1918 | 41,782,474 |
| 1901 | 20,086,780 | 1919 | 33,296,313 |
| 1902 | 17,486,550 | 1920 | 35,543,084 |
| 1903 | 17,495,954 | 1921 | 28,066,641 |
| 1904 | 18,977,359 | 1922 | 35,158,843 |
| 1905 | 22,461,325 | 1923 | 41,304,320 |
| 1906 | 24,980,546 | 1924 | 48,704,604 |
| 1907 | 25,882,560 | 1925 | 61,492,242 |
| 1908 | 23,851,277 | 1926 | 67,188,842 |
| 1909 | 24,443,025 | 1927 | 60,729,358 |
| 1910 | 26,377,066 | | |
| 1911 | 23,499,072 | Total | $1,048,837,828 |
| 1912 | 32,440,800 | | |

Table III. gives a statement in detail of the quantities and value of the different mineral products for the years 1925, 1926, and 1927.

TABLE III.—QUANTITIES AND VALUE OF MINERAL PRODUCTS FOR 1925, 1926, AND 1927.

| Description. | 1925. | | 1926. | | 1927. | |
|---|---|---|---|---|---|---|
| | Quantity. | Value. | Quantity. | Value. | Quantity. | Value. |
| Gold, placer ..... oz. | 16,476 | $280,092 | 20,912 | $355,503 | 9,191 | $156,247 |
| Gold, lode ..... oz. | 209,719 | 4,335,269 | 201,427 | 4,163,859 | 178,001 | 3,679,601 |
| Silver ..... oz. | 7,654,844 | 5,286,818 | 10,748,536 | 6,675,606 | 10,470,185 | 5,902,043 |
| Copper ..... lb. | 72,306,432 | 10,153,269 | 89,339,768 | 12,324,421 | 89,202,871 | 11,525,011 |
| Lead ..... lb. | 237,899,199 | 18,670,329 | 263,023,937 | 17,757,535 | 282,996,423 | 14,874,292 |
| Zinc ..... lb. | 98,257,099 | 7,754,450 | 142,876,947 | 10,586,610 | 145,225,443 | 8,996,135 |
| Coal ..... tons, 2,240 lb. | 2,328,522 | 11,642,610 | 2,330,036 | 11,650,180 | 2,453,827 | 12,269,135 |
| Coke ..... tons, 2,240 lb. | 75,185 | 526,295 | * | * | * | * |
| Structural materials and miscellaneous minerals ..... | | 2,843,110 | | 3,675,128 | | 3,326,894 |
| Totals ..... | | $61,492,242 | | $67,188,842 | | $60,729,358 |

* Coke not included in primary mineral production; coal used in making coke included in coal figures.

TABLE IV.—Output of Mineral Products by Districts and Divisions.

| Names. | Divisions. | | | Districts. | | |
|---|---|---|---|---|---|---|
| | 1925. | 1926. | 1927. | 1925. | 1926. | 1927. |
| North-western District (No. 1) | | | | $11,116,434 | $11,069,032 | $9,838,083 |
| Atlin, Stikine, and Liard | $98,365 | $234,936 | $93,098 | | | |
| Nass River | 5,977,875 | 5,853,804 | 4,943,253 | | | |
| Portland Canal | 4,170,310 | 4,678,739 | 4,753,782 | | | |
| Skeena, Queen Charlotte, and Bella Coola | 869,984 | 301,553 | 47,950 | | | |
| North-eastern District (No. 2) | | | | 321,876 | 552,203 | 263,809 |
| Cariboo and Quesnel | 207,538 | 299,428 | 105,515 | | | |
| Omineca and Peace River | 114,338 | 252,775 | 158,294 | | | |
| Central District (No 3) | | | | 333,063 | 831,975 | 658,927 |
| Nicola and Vernon | 230,281 | 273,979 | 224,209 | | | |
| Yale, Ashcroft, and Kamloops | 17,235 | 453,465 | 297,244 | | | |
| Lillooet and Clinton | 85,547 | 104,531 | 137,474 | | | |
| Southern District (No 4) | | | | 2,062,183 | 3,972,606 | 4,002,908 |
| Grand Forks, Greenwood, and Osoyoos | 893,985 | 668,165 | 699,808 | | | |
| Similkameen | 1,168,198 | 3,304,443 | 3,303,100 | | | |
| Eastern District (No 5) | | | | 33,982,941 | 36,704,484 | 31,762,346 |
| Fort Steele | 31,510,755 | 33,825,684 | 29,905,168 | | | |
| Windermere and Golden | 86,369 | 59,871 | 10,038 | | | |
| Ainsworth | 392,968 | 749,120 | 521,931 | | | |
| Slocan and Slocan City | 1,345,269 | 1,452,971 | 740,413 | | | |
| Nelson and Arrow Lake | 118,992 | 321,537 | 370,246 | | | |
| Trail Creek | 524,215 | 278,117 | 208,938 | | | |
| Revelstoke, Trout Lake, and Lardeau | 4,373 | 17,184 | 5,812 | | | |
| Western District (No. 6) | | | | 13,675,745 | 14,058,540 | 14,203,085 |
| Nanaimo, Alberni, Clayoquot, Quatsino, and Victoria (Vancouver Island) | 8,832,823 | 8,613,205 | 8,522,116 | | | |
| Vancouver and New Westminster (Mainland) | 4,842,922 | 5,445,335 | 5,680,969 | | | |
| Totals | | | $60,729,358 | $61,492,242 | $67,188,842 | $60,729,358 |

TABLE V.—Yield of Placer Gold to Date.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1858 | $705,000 | 1876 | $1,786,648 | 1894 | $405,516 | 1911 | $426,000 |
| 1859 | 1,615,070 | 1877 | 1,608,182 | 1895 | 481,683 | 1912 | 555,500 |
| 1860 | 2,228,543 | 1878 | 1,275,204 | 1896 | 544,026 | 1913 | 510,000 |
| 1861 | 2,666,118 | 1879 | 1,290,058 | 1897 | 513,320 | 1914 | 565,000 |
| 1862 | 2,656,903 | 1880 | 1,013,827 | 1898 | 643,346 | 1915 | 770,000 |
| 1863 | 3,913,563 | 1881 | 1,046,737 | 1899 | 1,344,900 | 1916 | 580,500 |
| 1864 | 3,735,850 | 1882 | 954,085 | 1900 | 1,278,724 | 1917 | 496,000 |
| 1865 | 3,491,205 | 1883 | 794,253 | 1901 | 970,100 | 1918 | 320,000 |
| 1866 | 2,662,106 | 1884 | 736,165 | 1902 | 1,073,140 | 1919 | 286,500 |
| 1867 | 2,480,868 | 1885 | 713,788 | 1903 | 1,060,420 | 1920 | 221,600 |
| 1868 | 3,372,972 | 1886 | 903,651 | 1904 | 1,155,300 | 1921 | 233,200 |
| 1869 | 1,774,978 | 1887 | 693,709 | 1905 | 969,300 | 1922 | 364,800 |
| 1870 | 1,336,956 | 1888 | 616,731 | 1906 | 948,400 | 1923 | 420,000 |
| 1871 | 1,799,440 | 1889 | 588,923 | 1907 | 828,000 | 1924 | 420,750 |
| 1872 | 1,610,972 | 1890 | 490,435 | 1908 | 647,000 | 1925 | 280,092 |
| 1873 | 1,305,749 | 1891 | 429,811 | 1909 | 477,000 | 1926 | 555,303 |
| 1874 | 1,844,618 | 1892 | 399,526 | 1910 | 540,000 | 1927 | 136,247 |
| 1875 | 2,474,004 | 1893 | 356,131 | | | | |
| | | | | Total | | | $78,174,795 |

TABLE VI.—PRODUCTION OF LODE MINES.

| Year. | Gold. | | Silver. | | Copper. | | Lead. | | Zinc. | | Total Value. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Oz. | Value. | Oz. | Value. | Pounds. | Value. | Pounds. | Value. | Pounds. | Value. | |
| | | $ | | $ | | $ | | $ | | $ | $ |
| 1887 | ..... | ..... | 17,690 | 17,331 | ..... | ..... | 204,800 | 9,216 | ..... | ..... | 26,547 |
| 1888 | ..... | ..... | 79,780 | 75,000 | ..... | ..... | 674,500 | 29,813 | ..... | ..... | 104,813 |
| 1889 | ..... | ..... | 53,192 | 47,873 | ..... | ..... | 165,100 | 6,498 | ..... | ..... | 54,371 |
| 1890 | ..... | ..... | 70,427 | 73,948 | ..... | ..... | ..... | ..... | ..... | ..... | 73,948 |
| 1891 | ..... | ..... | 4,500 | 4,000 | ..... | ..... | ..... | ..... | ..... | ..... | 4,000 |
| 1892 | ..... | ..... | 77,160 | 66,935 | ..... | ..... | 808,420 | 33,064 | ..... | ..... | 99,999 |
| 1893 | 1,170 | 23,404 | 227,000 | 195,000 | ..... | ..... | 2,135,023 | 78,996 | ..... | ..... | 297,400 |
| 1894 | 6,252 | 125,014 | 746,379 | 470,219 | 324,680 | 16,234 | 5,662,523 | 169,875 | ..... | ..... | 781,342 |
| 1895 | 39,264 | 785,271 | 1,496,522 | 977,229 | 952,840 | 47,642 | 16,475,464 | 532,255 | ..... | ..... | 2,342,397 |
| 1896 | 62,259 | 1,244,180 | 3,135,343 | 2,100,689 | 3,818,556 | 190,926 | 24,199,977 | 721,384 | ..... | ..... | 4,257,179 |
| 1897 | 106,141 | 2,122,820 | 5,472,971 | 3,272,836 | 5,325,180 | 266,258 | 38,841,135 | 1,390,517 | ..... | ..... | 7,052,431 |
| 1898 | 110,061 | 2,201,217 | 4,292,401 | 2,375,841 | 7,271,678 | 874,781 | 31,693,559 | 1,077,581 | ..... | ..... | 6,529,420 |
| 1899 | 138,315 | 2,857,573 | 2,939,413 | 1,663,708 | 7,722,591 | 1,351,453 | 21,862,436 | 878,870 | ..... | ..... | 6,751,604 |
| 1900 | 167,153 | 3,453,381 | 3,958,175 | 2,309,200 | 9,997,080 | 1,615,289 | 63,358,621 | 2,691,887 | ..... | ..... | 10,069,757 |
| 1901 | 210,384 | 4,348,603 | 5,151,333 | 2,884,745 | 27,603,746 | 4,446,963 | 51,582,906 | 2,002,733 | ..... | ..... | 13,683,044 |
| 1902 | 236,491 | 4,888,269 | 3,917,917 | 1,941,328 | 29,636,057 | 3,446,673 | 22,536,381 | 824,832 | ..... | ..... | 11,101,102 |
| 1903 | 232,831 | 4,812,616 | 2,996,204 | 1,521,472 | 34,359,921 | 4,547,535 | 18,089,283 | 689,744 | ..... | ..... | 11,571,367 |
| 1904 | 222,042 | 4,589,608 | 3,222,481 | 1,719,516 | 35,710,128 | 4,578,037 | 36,646,244 | 1,421,874 | ..... | ..... | 12,309,035 |
| 1905 | 238,660 | 4,933,102 | 3,439,417 | 1,971,818 | 37,692,251 | 5,876,222 | 56,580,703 | 2,399,022 | ..... | ..... | 15,180,164 |
| 1906 | 224,027 | 4,630,639 | 2,990,262 | 1,897,320 | 42,990,488 | 8,288,565 | 52,408,217 | 2,667,578 | ..... | ..... | 17,484,102 |
| 1907 | 196,179 | 4,055,020 | 2,745,448 | 1,703,825 | 40,832,720 | 8,166,544 | 47,738,703 | 2,291,458 | ..... | ..... | 16,216,847 |
| 1908 | 255,582 | 5,282,880 | 2,631,389 | 1,321,483 | 47,274,614 | 6,240,249 | 43,195,733 | 1,632,799 | ..... | ..... | 14,477,411 |
| 1909 | 238,224 | 4,924,090 | 2,532,742 | 1,239,270 | 45,597,245 | 5,918,522 | 44,396,346 | 1,709,259 | 8,500,000 | 400,000 | 14,191,141 |
| 1910 | 267,701 | 5,533,380 | 2,450,241 | 1,245,016 | 38,243,934 | 4,871,512 | 34,658,746 | 1,386,350 | 4,184,192 | 192,473 | 13,228,731 |
| 1911 | 228,617 | 4,725,513 | 1,892,364 | 958,293 | 36,927,656 | 4,571,644 | 26,872,397 | 1,069,521 | 2,634,544 | 129,092 | 11,454,063 |
| 1912 | 257,496 | 5,322,442 | 3,132,108 | 1,810,045 | 51,456,537 | 8,408,513 | 44,871,454 | 1,805,627 | 5,358,280 | 316,139 | 17,662,766 |
| 1913 | 272,254 | 5,627,490 | 3,465,856 | 1,968,606 | 46,460,305 | 7,094,489 | 55,364,677 | 2,175,832 | 6,758,768 | 324,421 | 17,190,838 |
| 1914 | 247,170 | 5,109,004 | 3,602,180 | 1,876,736 | 45,009,699 | 6,121,319 | 50,625,048 | 1,771,877 | 7,866,467 | 346,125 | 15,225,061 |
| 1915 | 250,021 | 5,167,934 | 3,366,506 | 1,588,991 | 56,918,405 | 9,835,500 | 46,503,590 | 1,939,200 | 12,982,440 | 1,460,524 | 19,992,149 |
| 1916 | 221,932 | 4,587,334 | 3,301,923 | 2,059,739 | 65,379,364 | 17,784,494 | 48,727,516 | 3,007,462 | 37,168,980 | 4,043,985 | 31,483,014 |
| 1917 | 114,523 | 2,367,190 | 2,929,216 | 2,265,749 | 59,007,565 | 16,038,256 | 37,307,465 | 2,951,020 | 41,848,513 | 3,166,259 | 26,788,474 |
| 1918 | 164,674 | 3,403,812 | 3,498,172 | 3,215,870 | 61,483,754 | 15,143,449 | 43,899,661 | 2,928,107 | 41,772,916 | 2,899,040 | 27,590,278 |
| 1919 | 152,426 | 3,150,645 | 3,403,119 | 3,592,673 | 42,459,339 | 7,939,896 | 29,475,968 | 1,526,855 | 56,737,651 | 3,540,429 | 19,750,498 |
| 1920 | 120,048 | 2,481,392 | 3,377,849 | 3,235,980 | 44,887,676 | 7,832,899 | 39,331,218 | 2,816,115 | 47,208,268 | 3,077,979 | 19,444,365 |
| 1921 | 135,663 | 2,804,154 | 2,673,389 | 1,591,201 | 39,036,993 | 4,879,624 | 41,402,288 | 1,693,354 | 49,419,372 | 1,952,065 | 12,920,398 |
| 1922 | 197,856 | 4,089,684 | 7,101,311 | 4,554,781 | 32,359,896 | 4,329,754 | 67,447,985 | 3,480,316 | 57,146,548 | 2,777,322 | 19,231,857 |
| 1923 | 179,245 | 3,704,994 | 6,032,986 | 3,718,129 | 57,720,290 | 8,323,266 | 96,663,152 | 6,321,770 | 58,343,462 | 3,278,903 | 25,347,062 |
| 1924 | 247,716 | 5,120,535 | 8,341,768 | 5,292,184 | 64,845,393 | 8,442,870 | 170,384,481 | 12,415,917 | 79,130,970 | 4,266,741 | 35,538,247 |
| 1925 | 209,719 | 4,335,269 | 7,654,844 | 5,286,818 | 72,306,432 | 10,153,269 | 237,899,199 | 18,670,329 | 98,257,099 | 7,754,450 | 46,200,135 |
| 1926 | 201,427 | 4,163,859 | 10,748,556 | 6,675,606 | 89,339,768 | 12,324,421 | 263,023,937 | 17,757,535 | 142,876,947 | 10,586,610 | 51,508,031 |
| 1927 | 178,001 | 3,679,601 | 10,470,185 | 5,902,043 | 89,202,871 | 11,525,011 | 282,996,423 | 14,874,292 | 145,225,443 | 8,996,135 | 44,977,082 |
| Totals | 6,331,516 | 130,651,919 | 139,640,719 | 86,689,046 | 1,370,154,652 | 221,492,079 | 2,196,711,279 | 121,850,734 | 903,420,860 | 59,508,692 | 620,192,470 |

TABLE VII.—PRODUCTION IN DETAIL OF THE

| DISTRICTS AND DIVISIONS. | YEAR | TONS. | GOLD—PLACER. | | GOLD—LODE. | | SILVER. | |
|---|---|---|---|---|---|---|---|---|
| | | | Ounces | Value. | Ounces. | Value. | Ounces. | Value. |
| | | | | $ | | $ | | $ |
| **North-western District (No. 1)** | | | | | | | | |
| Atlin | 1926 | 9,366 | 2,607 | 44,318 | 7,757 | 160,351 | 26,583 | 16,510 |
| | 1927 | 4,243 | 2,428 | 41,276 | 2,030 | 41,964 | 5,307 | 2,992 |
| Stikine | 1926 | | | | | | | |
| | 1927 | | | | | | | |
| Liard | 1926 | | 624 | 10,608 | | | | |
| | 1927 | | 365 | 6,205 | | | | |
| Nass River | 1926 | 1,217,927 | | | 7,906 | 163,431 | 409,470 | 254,310 |
| | 1927 | 1,375,878 | | | 4,960 | 102,532 | 298,152 | 168,068 |
| Portland Canal | 1926 | 267,140 | | | 124,207 | 2,567,582 | 3,092,503 | 1,920,661 |
| | 1927 | 285,171 | | | 122,242 | 2,526,962 | 3,302,244 | 1,861,475 |
| Skeena | 1926 | 26,769 | | | 11,128 | 230,036 | 6,927 | 4,302 |
| | 1927 | 38 | 105 | 1,785 | 56 | 1,158 | 12 | 7 |
| Queen Charlotte | 1926 | | | | | | | |
| | 1927 | | | | | | | |
| Bella Coola | 1926 | | | | | | | |
| | 1927 | | | | | | | |
| **North-eastern District (No. 2)** | | | | | | | | |
| Cariboo | 1926 | | 10,059 | 170,993 | | | | |
| | 1927 | 5 | 3,125 | 53,125 | | | 36 | 20 |
| Quesnel | 1926 | | 7,149 | 121,535 | | | | |
| | 1927 | | 2,319 | 39,423 | | | | |
| Omineca | 1926 | 1,861 | 59 | 1,000 | 439 | 9,075 | 239,053 | 148,469 |
| | 1927 | 3,900 | 236 | 4,012 | 165 | 3,411 | 173,072 | 97,561 |
| Peace River | 1926 | | 88 | 1,500 | | | | |
| | 1927 | | 177 | 3,009 | | | | |
| **Central District (No. 3)** | | | | | | | | |
| Nicola | 1926 | 63 | | | 12 | 248 | 1,060 | 658 |
| | 1927 | | | | | | | |
| Vernon | 1926 | 1 | | | | | 51 | 32 |
| | 1927 | 12 | 3 | 51 | 6 | 124 | 1,605 | 905 |
| Yale | 1926 | 320 | 29 | 500 | 59 | 1,220 | 16 | 10 |
| | 1927 | | 30 | 510 | | | | |
| Ashcroft | 1926 | | 15 | 250 | | | | |
| | 1927 | 1 | | | 1 | 21 | | |
| Kamloops | 1926 | 1,795 | 18 | 302 | 125 | 2,584 | 133,815 | 83,108 |
| | 1927 | 15,576 | 5 | 85 | 326 | 6,739 | 85,070 | 47,954 |
| Lillooet | 1926 | 10,500 | 29 | 500 | 4,580 | 94,677 | 807 | 501 |
| | 1927 | 14,553 | 59 | 1,003 | 5,979 | 123,596 | 1,098 | 619 |
| Clinton | 1926 | | 68 | 1,155 | | | | |
| | 1927 | | 133 | 2,261 | | | | |
| **Southern District (No. 4.)** | | | | | | | | |
| Grand Forks | 1926 | 11 | | | 20 | 413 | 16 | 10 |
| | 1927 | 59 | | | 1 | 21 | 491 | 277 |
| Greenwood | 1926 | 3,016 | | | 166 | 3,432 | 408,562 | 253,745 |
| | 1927 | 3,080 | | | 114 | 2,357 | 520,814 | 293,583 |
| Osoyoos | 1926 | 50,358 | | | 16,280 | 336,537 | 11,353 | 7,051 |
| | 1927 | 44,910 | | | 12,851 | 265,653 | 111 | 62 |
| Similkameen | 1926 | 669,356 | 96 | 1,621 | 3,988 | 82,439 | 141,236 | 87,717 |
| | 1927 | 757,675 | 59 | 1,003 | 4,031 | 83,328 | 137,971 | 77,774 |
| **Eastern District (No. 5)** | | | | | | | | |
| Fort Steele | 1926 | 1,198,931 | 29 | 500 | 321 | 6,636 | 4,942,364 | 3,069,554 |
| | 1927 | 1,453,916 | 126 | 2,142 | 939 | 19,411 | 5,123,925 | 2,888,357 |
| Windermere | 1926 | 806 | | | | | 20,356 | 12,643 |
| | 1927 | 110 | | | | | 2,583 | 1,456 |
| Golden | 1926 | | 13 | 221 | | | | |
| | 1927 | 6 | 21 | 357 | 2 | 41 | 264 | 149 |
| Ainsworth | 1926 | 59,559 | | | 26 | 537 | 139,832 | 86,845 |
| | 1927 | 40,432 | | | 123 | 2,542 | 120,908 | 68,156 |
| Slocan | 1926 | 56,387 | | | 139 | 2,873 | 938,880 | 583,110 |
| | 1927 | 25,052 | | | 176 | 3,638 | 402,065 | 226,644 |
| Slocan City | 1926 | 26 | | | | | 1,136 | 705 |
| | 1927 | 821 | | | | | 31,334 | 17,663 |
| Nelson | 1926 | 18,780 | | | 6,671 | 137,902 | 52,152 | 32,390 |
| | 1927 | 25,463 | | | 7,035 | 145,426 | 76,726 | 43,250 |
| Arrow Lake | 1926 | | | | | | | |
| | 1927 | | | | | | | |
| Trail Creek | 1926 | 25,484 | | | 7,600 | 157,106 | 24,705 | 15,344 |
| | 1927 | 15,450 | | | 6,625 | 136,951 | 16,868 | 9,508 |
| Revelstoke | 1926 | 9 | 29 | 500 | | | 143 | 89 |
| | 1927 | 39 | | | | | 2,025 | 1,142 |
| Trout Lake | 1926 | | | | | | | |
| | 1927 | 2 | | | | | | |
| Lardeau | 1926 | 137 | | | | | 274 | 154 |
| | 1927 | 28 | | | 8 | 165 | 9,314 | 5,785 |
| | | | | | 1 | 21 | 1,863 | 1,050 |
| **Western District (No. 6)** | | | | | | | | |
| Nanaimo | 1926 | | | | | | | |
| | 1927 | 10 | | | 2 | 41 | 6 | 3 |
| Alberni | 1926 | | | | | | | |
| | 1927 | | | | | | | |
| Clayoquot | 1926 | | | | | | | |
| | 1927 | | | | | | | |
| Quatsino | 1926 | | | | | | | |
| | 1927 | | | | | | | |
| Victoria | 1926 | | | | | | | |
| | 1927 | | | | | | | |
| New Westminster | 1926 | 1 | | | | | | |
| | 1927 | | | | | | 109 | 68 |
| Vancouver | 1926 | 1,156,470 | | | 9,995 | 206,615 | 148,113 | 91,989 |
| | 1927 | 1,349,591 | | | 10,336 | 213,664 | 165,361 | 93,214 |
| **TOTALS** | 1926 | 4,775,073 | 20,912 | 355,503 | 201,427 | 4,163,859 | 10,748,556 | 6,675,606 |
| | 1927 | 5,416,021 | 9,191 | 156,247 | 178,001 | 3,679,601 | 10,470,185 | 5,902,043 |

## METALLIFEROUS MINES FOR 1926 AND 1927.

| COPPER. | | LEAD. | | ZINC. | | TOTALS FOR DIVISIONS. | | TOTALS FOR DISTRICTS. |
|---|---|---|---|---|---|---|---|---|
| Pounds. | Value. | Pounds. | Value. | Pounds. | Value. | 1926. | 1927. | 1927. |
| | $ | | $ | | $ | $ | $ | $ |
| | | | | | | | | 9,789,083 |
| | | 46,648 | 3,149 | | | 224,328 | | |
| | | 12,582 | 661 | | | | 86,893 | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | 10,608 | | |
| | | | | | | | 6,205 | |
| 38,686,513 | 5,336,804 | 2,876 | 194 | | | 5,754,739 | | |
| 36,150,380 | 4,670,629 | 445 | 24 | | | | 4,941,253 | |
| 1,036,113 | 142,932 | 643,061 | 43,415 | 42,503 | 3,149 | 4,677,739 | | |
| 550,060 | 71,068 | 3,663,414 | 192,549 | 1,609,923 | 99,728 | | 4,751,782 | |
| 104,512 | 14,417 | | | | | 248,755 | | |
| | | | | | | | 2,950 | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | 238,352 |
| | | | | | | 170,993 | | |
| | | 295 | 15 | | | | 53,160 | |
| | | | | | | 121,535 | | |
| | | | | | | | 39,423 | |
| | | 645,631 | 43,588 | 503,295 | 37,292 | 239,424 | | |
| 1,344 | 174 | 398,888 | 20,966 | 268,562 | 16,636 | | 142,760 | |
| | | | | | | 1,500 | | |
| | | | | | | | 3,009 | |
| | | | | | | | | 231,526 |
| 8,170 | 1,127 | 2,995 | 202 | | | 2,235 | | |
| | | | | | | | | |
| | | 91 | 6 | | | 38 | | |
| | | 2,574 | 135 | 1,576 | 122 | | 1,337 | |
| | | | | | | 1,730 | | |
| | | | | | | | 510 | |
| | | | | | | 250 | | |
| | | | | | | | 21 | |
| | | 130,667 | 8,822 | 174,530 | 12,932 | 107,748 | | |
| 268,368 | 34,673 | 68,787 | 3,616 | 147,087 | 9,112 | | 102,179 | |
| | | | | | | 95,678 | | |
| | | | | | | | 125,218 | |
| | | | | | | 1,155 | | |
| | | | | | | | 2,261 | |
| | | | | | | | | 3,634,830 |
| | | | | | | 423 | | |
| 907 | 117 | 24,500 | 1,288 | 4,502 | 279 | | 1,982 | |
| 35,342 | 4,876 | 180,495 | 12,186 | 1,339 | 99 | 274,338 | | |
| | | 265,996 | 13,981 | 68,059 | 4,216 | | 314,137 | |
| | | | | | | 343,588 | | |
| | | | | | | | 265,715 | |
| 17,752,253 | 2,448,924 | 6,598 | 445 | 5,525 | 409 | 2,621,555 | | |
| 17,725,294 | 2,290,108 | 7,163 | 376 | 6,567 | 407 | | 2,452,996 | |
| | | | | | | | | 27,134,850 |
| 9,516 | 1,313 | 252,050,057 | 17,016,655 | 127,750,444 | 9,465,796 | 29,560,454 | | |
| 128 | 17 | 270,703,660 | 14,228,184 | 132,287,862 | 8,194,704 | | 25,332,815 | |
| | | 390,680 | 26,376 | 16,652 | 1,234 | 40,253 | | |
| | | 51,981 | 2,732 | 18,478 | 1,145 | | 5,333 | |
| | | | | | | 221 | | |
| | | 3,298 | 173 | 463 | 29 | | 749 | |
| | | 3,442,653 | 232,425 | 5,793,999 | 429,313 | 749,120 | | |
| | | 3,251,280 | 170,887 | 4,225,392 | 261,746 | | 503,331 | |
| | | 4,584,822 | 309,535 | 7,500,374 | 555,748 | 1,451,266 | | |
| | | 2,906,697 | 152,776 | 4,937,784 | 305,876 | | 688,934 | |
| | | | | | | 705 | | |
| | | 259,072 | 13,617 | 293,801 | 18,199 | | 49,479 | |
| 1,341 | 185 | 856,303 | 57,812 | 1,056,026 | 78,248 | 306,537 | | |
| 1,347 | 174 | 1,325,338 | 69,660 | 1,342,188 | 83,143 | | 341,653 | |
| | | | | | | | | |
| | | | | | | | | |
| 751,486 | 103,667 | | | | | 276,117 | | |
| 466,604 | 60,285 | | | | | | 206,744 | |
| | | 4,573 | 309 | | | 898 | | |
| | | 41,155 | 2,163 | 4,167 | 258 | | 3,563 | |
| | | | | | | | | |
| | | 646 | 34 | 945 | 59 | | 247 | |
| | | 35,786 | 2,416 | 32,260 | 2,390 | 10,756 | | |
| | | 8,652 | 455 | 7,687 | 476 | | 2,002 | |
| | | | | | | | | 4,704,688 |
| | | | | | | | | |
| 604 | 78 | | | | | | 122 | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| 43 | 6 | | | | | 74 | | |
| | | | | | | | | |
| 30,954,479 | 4,270,170 | | | | | 4,568,774 | | |
| 34,037,835 | 4,397,688 | | | | | | 4,704,566 | |
| 89,339,768 | 12,324,421 | 263,023,937 | 17,757,535 | 142,876,947 | 10,586,610 | 51,863,534 | | |
| 89,202,871 | 11,525,011 | 282,996,423 | 14,874,292 | 145,225,443 | 8,996,135 | | 45,133,329 | 45,133,329 |

TABLE VIII.—Coal Production per Year to Date.*

| Year. | Tons (2,240 lb.) | Value. | Year. | Tons (2,240 lb.) | Value. |
|---|---|---|---|---|---|
| 1836–1885 | 3,029,011 | $9,468,557 | 1908 | 1,677,849 | $5,872,472 |
| 1886 | 326,636 | 979,908 | 1909 | 2,006,476 | 7,022,666 |
| 1887 | 413,360 | 1,240,080 | 1910 | 2,800,046 | 9,800,161 |
| 1888 | 489,301 | 1,467,903 | 1911 | 2,193,062 | 7,675,717 |
| 1889 | 579,830 | 1,739,490 | 1912 | 2,628,804 | 9,200,814 |
| 1890 | 678,140 | 2,034,420 | 1913 | 2,137,483 | 7,481,190 |
| 1891 | 1,029,097 | 3,087,291 | 1914 | 1,810,967 | 6,338,385 |
| 1892 | 826,335 | 2,479,005 | 1915 | 1,611,129 | 5,638,952 |
| 1893 | 978,294 | 2,934,882 | 1916 | 2,084,093 | 7,294,325 |
| 1894 | 1,012,953 | 3,038,859 | 1917 | 2,149,975 | 7,524,913 |
| 1895 | 939,654 | 2,818,962 | 1918 | 2,302,245 | 11,511,225 |
| 1896 | 896,222 | 2,688,666 | 1919 | 2,267,541 | 11,337,705 |
| 1897 | 882,854 | 2,648,562 | 1920 | 2,595,125 | 12,975,625 |
| 1898 | 1,135,865 | 3,407,595 | 1921 | 2,483,995 | 12,419,975 |
| 1899 | 1,306,324 | 3,918,972 | 1922 | 2,511,843 | 12,559,215 |
| 1900 | 1,439,595 | 4,318,785 | 1923 | 2,453,223 | 12,266,115 |
| 1901 | 1,460,331 | 4,380,993 | 1924 | 1,939,526 | 9,697,630 |
| 1902 | 1,397,394 | 4,192,182 | 1925 | 2,328,522 | 11,642,610 |
| 1903 | 1,168,194 | 3,504,582 | 1926 | 2,330,036 | 11,650,180 |
| 1904 | 1,253,628 | 3,760,884 | 1927 | 2,453,827 | 12,269,135 |
| 1905 | 1,384,312 | 4,152,936 | | | |
| 1906 | 1,517,303 | 4,551,909 | Totals | 70,710,467 | $271,294,668 |
| 1907 | 1,800,067 | 6,300,235 | | | |

* For all years to 1925 (inclusive) figures are net coal production and do not include coal made into coke; subsequent figures are entire coal production, including coal made into coke.

TABLE IX.—Coke Production from Bee-hive Ovens in British Columbia from 1895 to 1925.

| Year. | Tons (2,240 lb.) | Value. | Year. | Tons (2,240 lb.) | Value. |
|---|---|---|---|---|---|
| 1895–97 | 19,396 | $96,980 | 1913 | 286,045 | $1,716,270 |
| 1898 (estimated) | 35,000 | 175,000 | 1914 | 234,577 | 1,407,462 |
| 1899 | 34,251 | 171,255 | 1915 | 245,871 | 1,475,226 |
| 1900 | 85,149 | 425,745 | 1916 | 267,725 | 1,606,350 |
| 1901 | 127,081 | 635,405 | 1917 | 159,905 | 959,430 |
| 1902 | 128,015 | 640,075 | 1918 | 188,967 | 1,322,769 |
| 1903 | 165,543 | 827,715 | 1919 | 91,138 | 637,966 |
| 1904 | 238,428 | 1,192,140 | 1920 | 67,792 | 474,544 |
| 1905 | 271,785 | 1,358,925 | 1921 | 59,434 | 416,038 |
| 1906 | 199,227 | 996,135 | 1922 | 45,835 | 320,845 |
| 1907 | 222,913 | 1,337,478 | 1923 | 58,919 | 412,433 |
| 1908 | 247,399 | 1,484,394 | 1924 | 30,615 | 214,305 |
| 1909 | 258,703 | 1,552,218 | 1925 | 75,185 | 526,295 |
| 1910 | 218,029 | 1,308,174 | | | |
| 1911 | 66,005 | 396,030 | | | |
| 1912 | 264,333 | 1,585,998 | Totals | 4,393,255 | $25,673,600 |

TABLE X.—Coke and By-products Production of British Columbia, 1927.

| | Quantity. | Value. |
|---|---|---|
| Coal used in making coke, long tons | 240,609 | $1,290,760 |
| Coke made in bee-hive ovens, long tons | 85,072 | $595,504 |
| Coke made in by-product ovens, long tons | 32,054 | 327,215 |
| Coke made in gas plants, long tons | 35,236 | 178,682 |
| Total coke made, long tons | 152,362 | $1,101,401 |
| Gas produced | | 1,222,379 |
| Tar produced | | 44,402 |
| Other by-products | | 18,080 |
| Total production value of coke industry | | $2,386,262 |

TABLE XI.—Production in Detail of Structural Materials, 1927.

| District and Division. | Cement. | Lime and Limestone. | Building-stone. | Riprap and Crushed Rock. | Sand and Gravel. | Pottery and Tile. | Clay. | Firebrick. | Face and Front Brick. | Red Brick. | Totals for Divisions. | Totals for Districts. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $ | $ | $ | $ | $ | $ | $ | $ | $ | $ | $ | $ |
| North-western District (No. 1) | | | | | | | | | | | | 49,000 |
| Atlin, Liard, and Stikine | | | | | | | | | | | | |
| Nass River | | | | 1,000 | 1,000 | | | | | | 2,000 | |
| Portland Canal | | | | | 2,000 | | | | | | 2,000 | |
| Skeena, Queen Charlotte, and Bella Coola | | 45,000 | | | | | | | | | 45,000 | |
| North-eastern District (No. 2) | | | | | | | | | | | | 12,182 |
| Cariboo and Quesnel | | 1,000 | | 1,000 | 6,182 | | | | | | 8,182 | |
| Omineca and Peace River | | 1,000 | | 1,000 | 2,000 | | | | | | 4,000 | |
| Central District (No. 3) | | | | | | | | | | | | 32,021 |
| Nicola and Vernon | | | | 3,400 | | | | | | 4,307 | 7,707 | |
| Yale, Ashcroft, and Kamloops | | 1,000 | | 2,000 | 21,314 | | | | | | 24,314 | |
| Lillooet and Clinton | | | | | | | | | | | | |
| Southern District (No. 4) | | | | | | | | | | | | 16,643 |
| Grand Forks, and Greenwood | | | | | 2,661 | | | | | 13,693 | 16,354 | |
| Osoyoos | | | | | | | | | | | | |
| Similkameen | | | | | 289 | | | | | | 289 | |
| Eastern District (No. 5) | | | | | | | | | | | | 58,803 |
| Fort Steele | | 350 | | 1,000 | 2,916 | | | | | | 4,266 | |
| Windermere and Golden | | | | | 3,150 | | | | | | 3,150 | |
| Ainsworth | | | 18,600 | | | | | | | | 18,600 | |
| Slocan and Slocan City | | | | 1,000 | 1,000 | | | | | | 2,000 | |
| Nelson | | 150 | 18,513 | 1,690 | 8,240 | | | | | | 28,593 | |
| Trail Creek | | 1,000 | | 1,000 | 194 | | | | | | 2,194 | |
| Western District (No. 6) | | | | | | | | | | | | 2,698,731 |
| Nanaimo | | 355,187 | 27,600 | | | | | | | 59,000 | 441,787 | |
| Victoria and Quatsino | 1,182,552 | 61,864 | | 2,000 | 40,399 | 14,024 | | | | 92,739 | 1,393,578 | |
| Vancouver | | | 59,627 | 156,886 | 151,648 | | | | | | 368,161 | |
| New Westminster | | | | | 3,929 | 195,346 | 15,802 | 223,409 | 50,955 | 5,764 | 495,205 | |
| Totals | 1,182,552 | 466,551 | 124,340 | 171,976 | 246,922 | 209,370 | 15,802 | 223,409 | 50,955 | 175,503 | 2,867,380 | 2,867,380 |

TABLE XII.—Miscellaneous Minerals: Production by Mineral Survey Districts, 1927.

| District. | Lime and Quartz for Flux. | Mica. | Gypsum. | Arsenic. | Pyrite. | Sodium Carbonate. | Platinum. | Iron. | Talc. | Silicate of Alumina. | District Totals. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $ | $ | $ | $ | $ | $ | $ | $ | $ | $ | $ |
| No. 1 | | | | | | | | | | | |
| No. 2 | | 70 | | | | | | | | 4,750 | 4,820 |
| No. 3 | | | 170,660 | | | 9,995 | | | | | 180,655 |
| No. 4 | 37,842 | | | 60,898 | | | 960 | | | | 99,700 |
| No. 5 | | | 30,492 | | | | | 450 | 356 | | 31,298 |
| No. 6 | 30,004 | | | | 112,137 | | | 900 | | | 143,041 |
| Totals | 67,846 | 70 | 201,152 | 60,898 | 112,137 | 9,995 | 960 | 1,350 | 356 | 4,750 | 459,514 |

TABLE XIII.

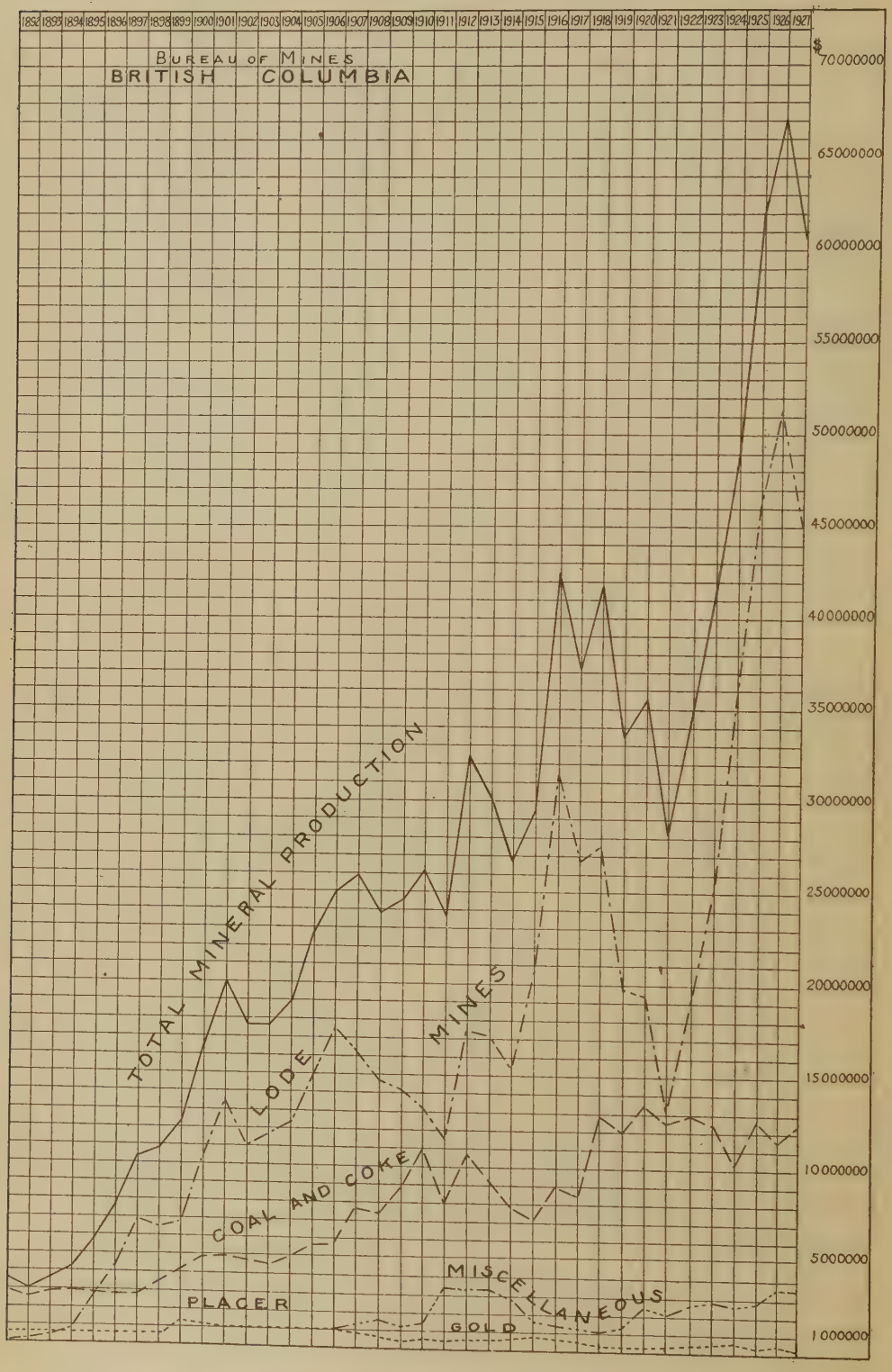
BUREAU OF MINES
BRITISH COLUMBIA
1892 1893 1894 1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927
$
70000000
65000000
60000000
55000000
50000000
45000000
40000000
35000000
30000000
25000000
20000000
15000000
10000000
5000000
1000000
TOTAL MINERAL PRODUCTION
LODE MINES
COAL AND COKE
PLACER
MISCELLANEOUS
GOLD

TABLE XIV.

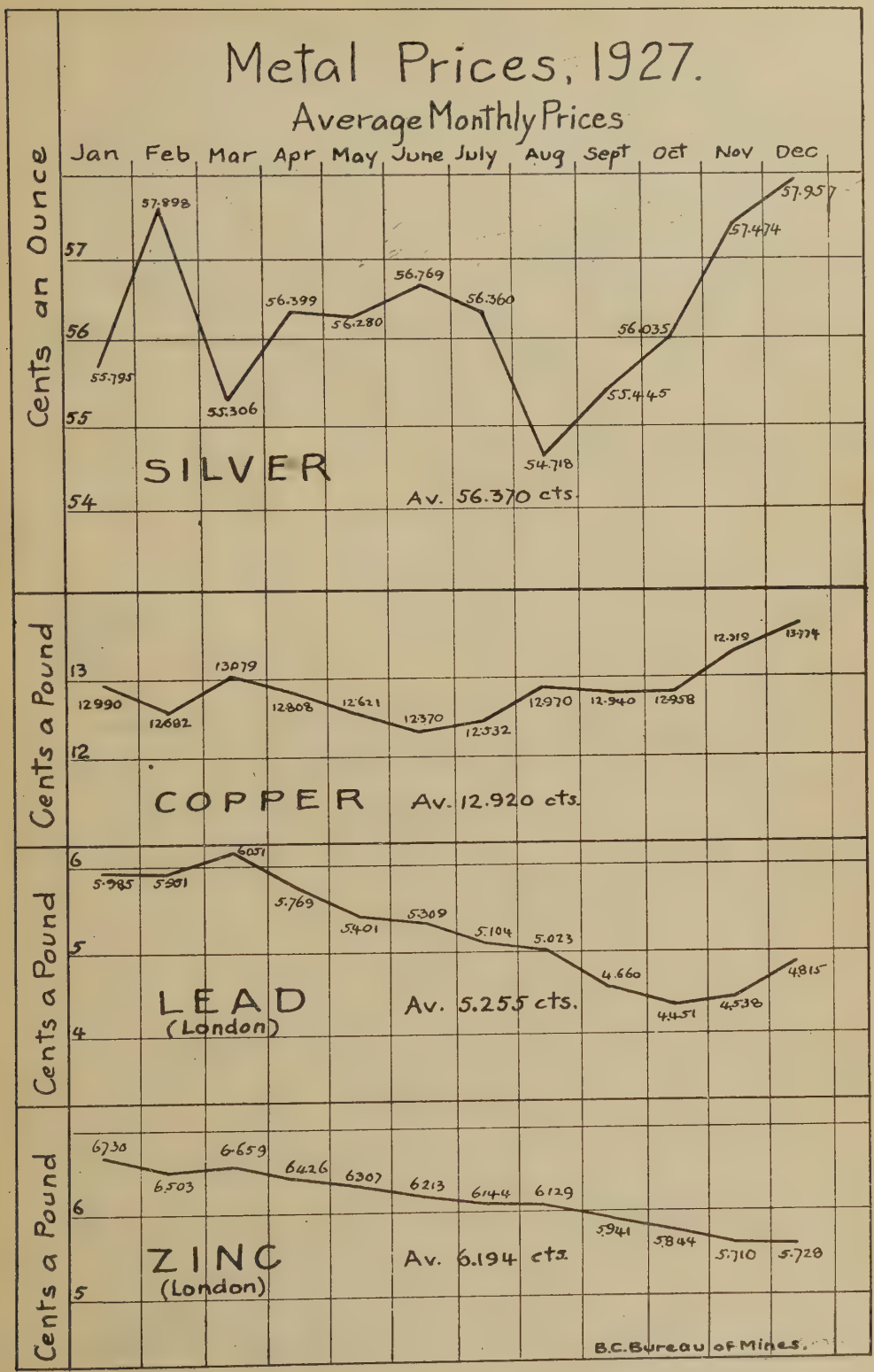
Metal Prices, 1927.
Average Monthly Prices
Jan Feb Mar Apr May June July Aug Sept Oct Nov Dec
Cents an Ounce
57
56
55
54
57.898
55.795
55.306
56.399
56.280
56.769
56.360
54.718
55.445
56.035
57.474
57.957
SILVER
Av. 56.370 cts.
Cents a Pound
13
12
12.990
12.682
13.079
12.808
12.621
12.370
12.332
12.970
12.940
12.958
12.319
13.774
COPPER
Av. 12.920 cts.
Cents a Pound
6
5
4
5.985
5.981
6.051
5.769
5.401
5.309
5.104
5.023
4.660
4.451
4.538
4.815
LEAD
(London)
Av. 5.255 cts.
Cents a Pound
6
5
6.730
6.503
6.659
6.426
6.307
6.213
6.144
6.129
5.941
5.844
5.710
5.728
ZINC
(London)
Av. 6.194 cts.
B.C. Bureau of Mines.

TABLE XV.

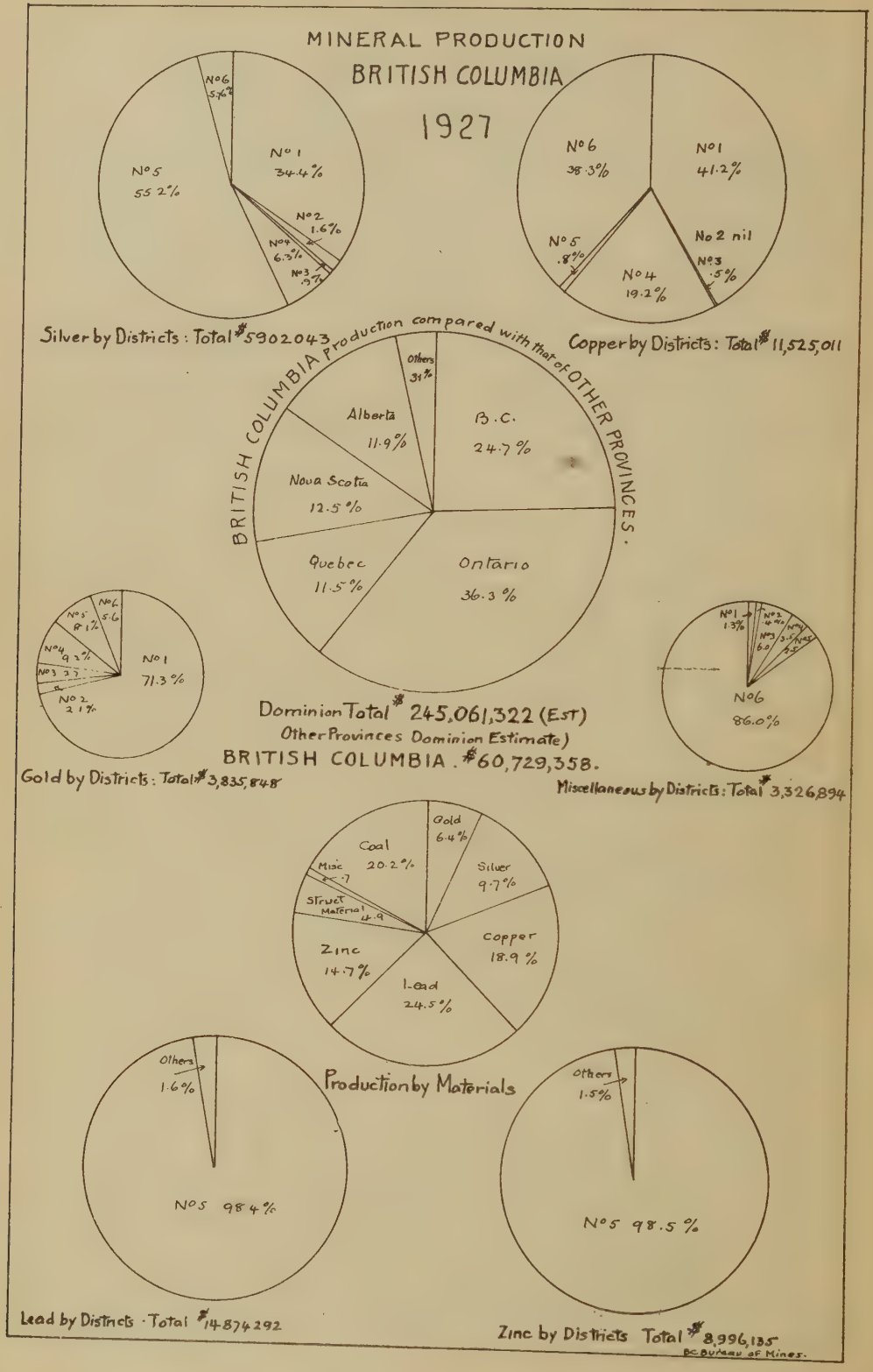
MINERAL PRODUCTION
BRITISH COLUMBIA
1927
No 6 5.7%
No 1 34.4%
No 5 55.2%
No 2 1.6%
No 4 6.3%
No 3 .9%
Silver by Districts: Total $5902043
No 6 38.3%
No 1 41.2%
No 5 .8%
No 2 nil
No 3 .5%
No 4 19.2%
Copper by Districts: Total $11,525,011
BRITISH COLUMBIA Production compared with that of OTHER PROVINCES.
Others 3.1%
Alberta 11.9%
B.C. 24.7%
Nova Scotia 12.5%
Quebec 11.5%
Ontario 36.3%
Dominion Total $ 245,061,322 (Est)
Other Provinces Dominion Estimate)
BRITISH COLUMBIA. $60,729,358.
No 1 71.3%
No 2 2.1%
No 3 3.3%
No 4 9.2%
No 5 8.1%
No 6 5.6%
Gold by Districts: Total $3,835,848
No 1 1.3%
No 6 86.0%
Miscellaneous by Districts: Total 3,326,894
Coal 20.2%
Gold 6.4%
Silver 9.7%
Misc .7
Struct Material 4.9
Copper 18.9%
Zinc 14.7%
Lead 24.5%
Production by Materials
Others 1.6%
No 5 98.4%
Lead by Districts · Total 14874292
Others 1.5%
No 5 98.5%
Zinc by Districts Total 8,996,135
BC Bureau of Mines.

TABLE XVI.—Men employed in the Mineral Industry of British Columbia, 1927.

| District. | Placer-mining. | Lode-mining. | | | In Concentrators. | In Smelters. | Coal-mining. | | | Structural Materials. | | Miscellaneous Minerals. | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Under. | Above. | Total. | | | Under. | Above. | Total. | Quarries. | Plants. | | |
| No. 1 | 90 | 564 | 369 | 933 | 70 | 522 | ..... | ..... | ..... | ..... | ..... | 20 | 1,635 |
| No. 2 | 243 | 34 | 39 | 73 | 5 | ..... | 11 | 2 | 13 | 4 | ..... | 3 | 341 |
| No. 3 | 27 | 170 | 125 | 295 | 46 | ..... | 83 | 32 | 115 | 18 | ..... | 89 | 590 |
| No. 4 | 21 | 298 | 333 | 631 | 160 | ..... | 271 | 169 | 440 | 20 | ..... | 1 | 1,273 |
| No. 5 | 34 | 908 | 797 | 1,705 | 396 | 2,320 | 1,033 | 461 | 1,494 | 16 | ..... | 7 | 5,972 |
| No. 6 | ..... | 697 | 253 | 950 | 177 | ..... | 2,248 | 915 | 3,163 | 589 | 138 | 2 | 5,019 |
| Totals | 415 | 2,671 | 1,916 | 4,587 | 854 | 2,842 | 3,646 | 1,579 | 5,225 | 647 | 138 | 122 | 14,830 |

TABLE XVII.—Tonnage, Number of Mines, and Net Value of Lode Minerals.

| District. | Tonnage. | No. of Shipping Mines, 1927. | No. of Mines shipping over 100 Tons. | Net Value of Lode Minerals produced. |
|---|---|---|---|---|
| No. 1 | 1,665,330 | 17 | 7 | $7,454,097 |
| No. 2 | 3,905 | 7 | 1 | 100,597 |
| No. 3 | 30,142 | 7 | 4 | 189,836 |
| No. 4 | 805,724 | 22 | 5 | 2,281,318 |
| No. 5 | 1,561,319 | 77 | 34 | 14,172,804 |
| No. 6 | 1,349,601 | 2 | 1 | 3,551,712 |
| Totals | 5,416,021 | 132 | 52 | $27,750,364 |

## SUMMARY OF STATISTICAL TABLES.

In compiling the Statistical Tables for the 1927 Annual Report the same general arrangement has been followed as in previous years, and the order of the tables is the same as in the 1926 Annual Report.

Referring to the preceding Statistical Tables showing the mineral production of the Province, the following is a summary of their contents:—

Table I. shows the total gross value of each mineral product mined in the Province up to the end of 1927, aggregating $1,048,837,828. From this table it will be seen that coal-mining has produced more than any other separate class of mining, a total of $296,968,268; followed next in importance by copper at $221,492,079, and next in order is lode gold at $130,651,919, with lead in fourth place at $121,850,734.

Table II. shows the value of the total production of the mines of the Province from 1852 to 1895 (inclusive) and for each year from 1896 to 1927 (inclusive). The value of the total mineral production of the Province up to the end of 1927 was $1,048,837,828.

Table III. gives the quantities in the customary units of measure and the values of the various metals or minerals which go to make up the total of the mineral production of the Province for 1927, and also, for the purpose of comparison, similar data for the two preceding years.

Table IV. shows the proportions of the total mineral productions made in each of the various districts into which the Province is divided.

It will be noted that again this year the Eastern District has the honour of first place on the list, followed, in order of importance, by the Western, North-western, Southern, Central, and North-eastern Districts. The Western and Eastern Districts owe a considerable proportion of their output to the coal-mines situated within their limits, whereas in the other districts the production is chiefly from metal-mining.

The Western District also derives a fair proportion of its production from structural materials, due to the larger cities therein; this year this amounted to $2,698,731, as shown in Table XI.

Table V. shows the statistical record of the placer mines of the Province from 1858 to 1927 and shows a total production of $78,174,795. The value of the output for 1927 was $156,247, a decrease, as compared with the previous year, of $199,256.

Table VI. relates entirely to the lode mines of the Province, and shows the quantities and values of the various metals produced each year since the beginning, in 1887, of such mining in the Province. The gross value of the product of these mines to date is $620,192,470; this figure includes the zinc production of 1909 and all subsequent years.

Table VII. gives the details of production of metalliferous mines of the Province for the years 1926 and 1927 and the divisions and districts in which such productions were made, showing the tonnage of ore mined in each district, with its metallic contents and the market value of the contained metals recovered in treatment.

The total tonnage of ore mined in the Province during the year 1927 was 5,416,021 tons, having a gross value of $44,977,082, and, with the placer gold, a total value of $45,133,329.

Table VIII. contains the statistics of production of the coal-mines of the Province. The total amount of coal produced to the end of 1927 was 70,710,467 tons (2,240 lb.), worth $271,294,668. Of this, 2,453,827 tons was produced in 1927, valued at $12,269,135. In these figures of coal production up to and including 1925 the coal used in making coke is not included, as such coal is accounted for in the figures of output of coke, but the 1926 and 1927 figures include coal made into coke.

More detailed statistics as to the coal production of the Province are given in the reports of the Inspection Branch.

Table IX. shows the production of coke from bee-hive ovens in the Province up to the end of 1925.

Table X., commenced in 1926, shows complete statistics of the coke industry of the Province. Commencing with 1926, coke is not considered a primary mineral production as the coal used in making coke is included and valued in the coal production total. The statistics of the coke industry for the current year are, however, given in this table, as they are believed to be of interest to the mineral industry.

Table XI. shows in detail the production of structural materials. The production in 1927 was valued at $2,867,380, as compared with $3,342,545 in 1926. Rock used as flux by smelters does not appear in this table, but will be found in Table XII., "Miscellaneous Minerals."

Table XII. (formerly Table X.) shows the production of "Miscellaneous Minerals" by districts. This branch of the industry is small, but has increased from $163,038 in 1925 to $332,583 in 1926 and up to $459,514 in 1927. It is now more important than placer-mining.

Table XIII. presents in graphic form the facts shown in figures in the tables, and demonstrates to the eye the rapid growth of mining in the Province, and also the fluctuations to which it has been subject.

From this table it will be seen that coal-mining increased steadily until 1909; from then until 1917 a decrease occurred, since which time progress was upward to 1920 and since then there has been a slight decrease.

The curve of lode production shows on the average a steady growth, but some marked interruptions have occurred; it is satisfactory that a substantial increase in production has occurred in the last five years. The total mineral production also shows a progressive increase, with, however, some large fluctuations.

Table XIV. shows graphically the metal prices for 1927.

Table XV. shows graphically the Dominion mineral production (preliminary estimates for all Provinces except British Columbia) in 1927 by Provinces, and the outputs by minerals and districts of the British Columbia production.

Table XVI. shows the total number of men employed in the mineral industry of the Province. The figures are probably incomplete with regard to a number of very small operators and leasers working intermittently, but the totals for the different branches indicate very closely the actual men employed.

Table XVII. shows the tonnages of ore and number of shipping mines for each district. A column in this table shows the net value of lode minerals produced by districts. 1926 was the first year that statistics were collected from which to compile such figures. The net value is

the amount given by the mine-owner as being the money value received for his ore; it is the gross value less deductions for transportation, smelting, refining, and marketing charges on the contained metals.

The total net value of $27,750,364 is believed to be approximately correct, although the statistics obtained were not as complete as desired. In many instances small operators and leasers did not give a return of net value, and in all these cases the value was estimated.

## REVIEW BY METALS AND MINERALS.

### Gold.

**Placer Gold.** The production of placer gold was $156,247, as compared with $355,503 in 1926. The principal placer camps of the Province are in the Atlin and Cariboo Districts. In the former, production was normal or somewhat better than in 1926, but a heavy drop took place in the Cariboo output.

During the year the Kafue Copper Development Company's dredge operating near Barkerville made virtually no production, as all season it was engaged in digging its way from Antler creek to a new area on Cunningham Pass creek. This work is completed and production will commence again in 1928.

The Cedar Creek Company made a very much smaller production than in 1926, but extensive testing of the ground was done and it is expected that next season production will again assume normal proportions.

In the Similkameen Division much testing of placer-ground was carried out and some equipment was installed. The production was again quite small, but the results of development may materialize in 1928.

From the statistics of the Gold Commissioners' offices of placer leases issued and renewed it is apparent that there is no falling-off in exploratory interest in placer-ground throughout the Province. While production, for certain explainable reasons, has fallen off in 1927, it is probable that the extensive prospecting and development of placer-ground during the last two years will result in an increased output in the near future.

**Gold from Lode-mining.** The value of lode gold produced in 1927 was $3,679,601, as compared with $4,163,859 in 1926, a decrease of $484,258, or about 11.2 per cent. Of the total, Portland Canal Division produced $2,526,962, or 70 per cent. The decrease is due in part to the closing-down of the Belmont-Surf Inlet mine, which formerly made a substantial output, and slight decreases from a number of other producers. A considerable part of the gold production comes as a by-product of copper and silver mining and is subject to yearly variations according to the grade of ore treated.

No great increase in gold production is to be expected in the immediate future, but a number of satisfactory developments have taken place during the year. The *Pioneer* and *Coronation* mines in the Bridge River section, the *Yankee Girl* and *Goodenough* near Ymir, and the *Engineer* mine at Atlin are all expected to contribute larger outputs in 1928.

The following table shows the gold production by Mining Divisions for the years 1926 and 1927:—

| Mining Divisions. | 1926. Oz. | 1927. Oz. |
|---|---|---|
| Portland Canal | 124,207 | 122,242 |
| Skeena | 11,128 | 56 |
| Osoyoos | 16,280 | 12,851 |
| Trail Creek | 7,600 | 6,625 |
| Nass River | 7,906 | 4,960 |
| Vancouver | 9,995 | 10,336 |
| Lillooet | 4,580 | 5,979 |
| Atlin | 7,757 | 2,030 |
| Nelson | 6,671 | 7,035 |
| Similkameen | 3,988 | 4,031 |
| All others | 1,315 | 1,856 |
| Totals | 201,427 | 178,001 |

### Silver.

The quantity of silver produced in 1927 was 10,470,185 oz., worth $5,902,043, a decrease from the production in 1926 in quantity of 278,371 oz., or 2.6 per cent., and in value of $773,563.

The Fort Steele and Portland Canal Divisions together produced 8,426,169 oz., or 80.5 per cent. of the total output. The slight decline in silver production is mainly due to curtailment of production in the Slocan Division, where less than half the output of 1926 was made. This is only a temporary condition and it is expected that a substantially increased output will be made by this Division in 1928.

The *Sullivan*—the largest silver-producer in Canada—and the *Premier* both slightly increased their output as compared with 1926.

The market price of silver was fairly steady throughout the year, the average for December being about 2 cents an ounce higher than for January. The average price for the year was 56.37 cents an ounce, as compared with 62.107 cents for 1926, a decline of 9.23 per cent.

All indications point to a considerable increase in silver-output in 1928.

The following table shows the silver production by Mining Divisions for the years 1926 and 1927:—

| Mining Divisions. | 1926. Oz. | 1927. Oz. |
|---|---|---|
| Fort Steele | 4,942,364 | 5,123,925 |
| Portland Canal | 3,092,503 | 3,302,244 |
| Slocan | 938,880 | 402,065 |
| Greenwood | 408,562 | 520,814 |
| Nass River | 409,470 | 298,152 |
| Omineca | 239,053 | 173,072 |
| Vancouver | 148,113 | 165,361 |
| Trail Creek | 24,705 | 16,868 |
| Ainsworth | 139,832 | 120,908 |
| Similkameen | 141,236 | 137,971 |
| Kamloops | 133,815 | 85,070 |
| Nelson | 52,152 | 76,726 |
| All others | 77,871 | 47,009 |
| Totals | 10,748,556 | 10,470,185 |

### Copper.

The amount of copper produced in 1927 was 89,202,871 lb., valued at $11,525,011. This represents, as compared with 1926, a decrease of 136,897 lb., or 0.15 per cent., and a decrease in value of $799,410.

The three large copper-mines of the Province—*Hidden Creek*, *Britannia*, and *Copper Mountain*—all treated larger tonnages than in 1926, and the *Britannia* made a larger output of copper. Owing to slightly lower-grade ore being handled, the *Hidden Creek* and *Copper Mountain* mines made a little smaller output of copper than in 1926.

The *Britannia* mine is mining and milling at the rate of 4,000 tons a day and is expected to take first place in copper production in 1928.

The average price of copper for the year was 12.92 cents a pound, which compares with 13.795 cents for 1926, a decline of 6.35 per cent.

The following table shows the production of copper by Mining Divisions for the years 1926 and 1927:—

| Mining Divisions. | 1926. Lb. | 1927. Lb. |
|---|---|---|
| Nass River | 38,686,513 | 36,150,380 |
| Vancouver | 30,954,479 | 34,037,835 |
| Similkameen | 17,752,253 | 17,725,294 |
| Trail Creek | 751,486 | 466,604 |
| Portland Canal | 1,036,113 | 550,060 |
| Skeena | 104,512 | ..... |
| All others | 54,412 | 273,298 |
| Totals | 89,339,768 | 89,202,871 |

### Lead.

The amount of lead produced in 1927 was 282,996,423 lb., valued at $14,874,292. This represents, as compared with the previous year, an increase in quantity of 19,972,486 lb., or 7.6 per cent., but owing to a lower average market price for the metal, a decrease in value of $2,883,243. This is another high record output for lead-mining in the Province.

This enormous production of lead comes largely from the *Sullivan* mine of the Consolidated Mining and Smelting Company of Canada. This mine has regularly increased its lead production every year since 1919 and is now mining and milling at the rate of 4,000 tons a day. It is expected that the current production will at least be maintained for many years to come.

During 1927 lead production from the Slocan Division was somewhat curtailed, but this was offset by a greater production from Portland Canal Division. During the year much development and equipment of properties with concentrators was carried out in the Slocan district, which should result in a largely increased production in 1928.

The average London market price of lead in 1927 was 5.256 cents a pound, as compared with 6.7513 cents in 1926, a decrease of 22.2 per cent.

The following table shows the production of lead, according to Mining Divisions, for the years 1926 and 1927:—

| Mining Divisions. | 1926. Lb. | 1927. Lb. |
|---|---|---|
| Fort Steele | 252,050,057 | 270,703,660 |
| Slocan | 4,584,822 | 2,906,697 |
| Ainsworth | 3,442,653 | 3,251,280 |
| Windermere | 390,680 | 51,981 |
| Portland Canal | 643,061 | 3,663,414 |
| Nelson | 856,303 | 1,325,338 |
| Greenwood | 180,495 | 265,996 |
| Omineca | 645,631 | 398,888 |
| All others | 230,235 | 429,169 |
| Totals | 263,023,937 | 282,996,423 |

The Fort Steele Division continues to head the list, with 97.7 per cent. of the total output of the Province for the year. In Ainsworth Division the largest producer was the *Bluebell* mine.

### Zinc.

The production of zinc in 1927 was 145,225,443 lb., valued at $8,996,135. Compared with the 1926 output, this is an increase in quantity of 2,348,496 lb., or 1.65 per cent., but owing to a lower average market price for the metal a decrease in value of $1,590,475. The increased production was due to a larger output from the *Sullivan* mine and Northern properties, which more than compensated for a decline in Slocan and Ainsworth Divisions.

Similarly as with lead, the mainstay of the Provincial zinc production is the *Sullivan* mine.

Provided the market price of the metal does not materially decline, it is expected that a considerably increased zinc production will be made in 1928.

The average London price of zinc for the year was 6.1946 cents a pound, as compared with 7.4096 cents in 1926, a decrease of 16.4 per cent.

The following table shows the production of zinc by Mining Divisions for the years 1926 and 1927:—

| Mining Divisions. | 1926. Lb. | 1927. Lb. |
|---|---|---|
| Fort Steele | 127,750,444 | 132,287,862 |
| Slocan | 5,793,999 | 4,937,784 |
| Ainsworth | 7,500,374 | 4,225,392 |
| Portland Canal | 42,503 | 1,609,923 |
| Nelson | 1,056,026 | 1,342,188 |
| All others | 733,601 | 822,294 |
| Totals | 142,876,947 | 145,225,443 |

## COAL.

The production of coal in 1927 was 2,453,827 long tons, which shows an increase, as compared with 1926, of 123,791 tons.

Summarizing the Provincial production of coal, the following table shows the output:—

| | 1924. | 1925. | 1926. | 1927. |
|---|---|---|---|---|
| Vancouver Island mines ..... tons, 2,240 lb. | 1,486,332 | 1,412,757 | 1,293,175 | 1,331,325 |
| Nicola-Princeton mines ..... ,, | 226,455 | 175,474 | 187,153 | 213,292 |
| Crowsnest mines ..... ,, | 273,518 | 854,480 | 848,448 | 907,519 |
| Northern District ..... ,, | 1,228 | 1,581 | 1,260 | 1,691 |
| Total quantity of coal mined ..... ,, | 1,987,533 | 2,444,292 | 2,330,036 | 2,453,827 |

The greater part of the Provincial coal production is still being mined by three companies—the Crow's Nest Pass Coal Company, of East Kootenay; the Canadian Collieries (Dunsmuir), Limited; and the Western Fuel Corporation, of Vancouver island, which mined, collectively, 76 per cent. of the output.

Of the other collieries: In the Coast District, on Vancouver island, the Granby Company, from its colliery near Cassidy, produced 190,653 tons; the King & Foster Coal Company, Limited, made a production of 546 tons; the East Wellington Coal Company, 47,454 tons; the Diamond Jubilee mine, 282 tons; and 276 tons was produced from the Fiddick mine. In the Nicola Valley section of the district the Middlesboro Colliery Company mined 42,945 tons; the Coalmont Colliery, 152,595 tons; the Tulameen Valley Coal Company, Limited, produced 14,406 tons; the Southern Okanagan Collieries, Limited, produced 576 tons; and the Lynden Coal Mines, Limited, produced 2,770 tons.

In the Northern District the Telkwa Collieries, Limited, shipped 1,671 tons, and the Canadian National Anthracite Syndicate 20 tons. These two properties, for convenience, have been included in the Coast District figures.

In the East Kootenay District, in addition to the Crow's Nest Pass Coal Company, which produced 777,402 tons, the Corbin Coals, Limited, produced 130,117 tons.

The collieries of the Coast District, including the Nicola-Princeton and Telkwa fields, are to be credited for 1927 with about 63 per cent. of the total coal-output.

The output of the collieries of the Province for 1927 was, as already stated, 2,453,827 tons, which includes 24,190 tons of coal added to stock.

Of this amount, there was sold for consumption in Canada, 1,581,176 tons; sold for consumption in the United States, 377,564 tons; sold in other countries, *nil;* making the total coal sales for the year 1,958,740 tons of 2,240 lb.

In addition to the coal sold, there was used by the Crow's Nest Pass Coal Company in the manufacture of coke 129,933 tons; used under companies' boilers, etc., 191,163 tons; while 149,801 tons was lost in washing and screening.

The following table indicates the markets in which the coal-output of the Province was sold:—

| Coal. | Coast District. | Crowsnest Pass District. | Total for Province. |
|---|---|---|---|
| Sold for consumption in Canada ..... tons, 2,240 lb. | 1,135,698 | 445,478 | 1,581,176 |
| Sold for export to United States ..... ,, | 105,569 | 271,995 | 377,564 |
| Sold for export to other countries ..... ,, | ..... | ..... | ..... |
| Total coal sales ..... ,, | 1,241,267 | 717,473 | 1,958,740 |

### Collieries of Coast District.

The collieries of the Coast District, which includes those on Vancouver island and in the Nicola-Princeton fields and two small collieries in the Northern District, mined 1,546,308 tons of coal in 1927, which includes 19,506 tons added to stock, making 1,526,802 tons distributed from these collieries in 1927. This amount was distributed thus:—

| | Tons. | Tons. |
|---|---|---|
| Sold as coal in Canada | 1,135,698 | |
| Sold as coal in United States | 105,569 | |
| Sold as coal in other countries | | |
| Total sold as coal | | 1,241,267 |
| Used under companies' boilers, etc. | | 135,734 |
| Lost in washing, etc. | | 149,801 |
| | | 1,526,802 |
| *Plus* coal added to stock | | 19,506 |
| Gross output | | 1,546,308 |

The total coal sales of the Coast collieries for 1927 show, as compared with the sales of the previous year, an increase of 28,550 tons, equivalent to about 2.3 per cent.

The coal sold in Canada by the collieries of the Coast District in 1927 shows an increase of 19,673 tons, or about 1.7 per cent. more than the preceding year; the amount exported to the United States was 8,877 tons more than the preceding year, an increase of about 9 per cent.

On Vancouver island seven companies produced coal in 1927—the Canadian Collieries (Dunsmuir), Limited; the Western Fuel Corporation of Canada, Limited; the Granby Consolidated Mining, Smelting, and Power Company; King & Foster Coal Company, Limited; the East Wellington Coal Company, the Diamond Jubilee mine, and the Fiddick mine; the majority of these companies each operate two, or more. collieries. The combined output of the Island collieries was 1,331,325 tons.

In the Nicola and Princeton coalfields of the Coast District the Middlesboro Colliery Company produced 42,945 tons; the Coalmont Collieries, 152,595 tons; the Tulameen Valley Coal Company, Limited, 14,406 tons; the Southern Okanagan Collieries, Limited, produced 576 tons; and the Lynden Coal Mines, Limited, 2,770 tons. The total output of this portion of the subdistrict was 213,292 tons.

The Telkwa Collieries produced 1,671 tons and the Canadian National Anthracite Syndicate 20 tons.

### East Kootenay Coalfield.

There were only two companies operating in this district in 1927—the Crow's Nest Pass Coal Company, operating two separate collieries, which together mined 777,402 tons; and the Corbin Coals, Limited, which mined 130,117 tons; making an output for the district for 1927 of 907,519 tons of coal.

The amount of coal actually distributed was 902,835 tons, which, together with 4,684 tons added to stock, shows the total production of 907,519 tons.

The following table shows the distribution made of the coal of this district:—

| | Tons. | Tons. |
|---|---|---|
| Sold as coal in Canada | 445,478 | |
| Sold as coal in United States | 271,995 | |
| Total sold as coal | | 717,473 |
| Used by Crow's Nest Pass Coal Co. in making coke | | 129,933 |
| Used by the companies under boilers, etc. | | 55,429 |
| | | 902,835 |
| *Plus* coal added to stock | | 4,684 |
| Gross output | | 907,519 |

## STRUCTURAL MATERIALS.

The output of structural materials in 1927 was valued at $2,867,380, a decrease of $475,165, or 14.2 per cent., as compared with 1926.

Building construction in Vancouver, where the bulk of the structural materials are marketed, is reported to have been slightly less than in 1926, which probably accounts for some lowering in the value of the output.

This branch of the mineral industry is one that will expand as the population of the Province grows. A plentiful supply of the various raw materials is found in many parts of the Province.

Approximately 94 per cent. of the total production of building materials comes from the Coast District and the larger part of this is marketed in the Coast cities.

*Building-stone.*—The production of building-stone in 1927 was valued at $124,340. A considerable part of this production consisted of pulp-stones for use in pulp-mills.

*Red Brick.*—The production of red brick during 1927 was valued at $175,503. The price of brick given by the operators varies from $15 to $20 a thousand, depending on quality.

*Firebrick.*—The only company producing firebrick in the Province is the Clayburn Company, Limited, with plants at Clayburn and Kilgard. The fireclay is found here as a bed occurring in bedded rocks of Eocene age. Shales, sandstone, and conglomerates, all but little consolidated, make up this sedimentary series. The shales are quarried or mined for brick-making and one bed is an excellent fireclay. Firebrick is the principal manufactured article produced by this company, but, in addition, considerable quantities of paving-brick, tiles, drain-pipes, fireclay blocks and shapes, and prepared fireclay are made.

The production of lime and limestone for 1927 was valued at $466,551, as compared with $557,049 in 1926.

*Sand and Gravel.*—The sand and gravel production in 1927 was $246,922, as compared with $331,302 in 1926.

*Crushed Rock.*—The returns for crushed rock show an output valued at $171,976, as compared with $296,597 in 1926.

## MISCELLANEOUS MINERALS.

The production of miscellaneous minerals in 1927 was valued at $459,514, an increase, as compared with 1926, of $126,931, or 38 per cent.

Increased outputs of gypsum, pyrite, arsenic, sodium carbonate, and silicate of alumina were made, as compared with the previous year. The largest increase was in pyrite, owing to the substantial contribution from the *Britannia* mine.

Attention is now being directed to the possibility of utilizing certain non-metallic minerals in connection with various manufacturing industries.

*Iron.*—Shipments of bog-iron ore valued at $1,350 were made from Alta lake to Vancouver and Windermere to Calgary. It was used as cleaning material and not as iron ore.

Some magnetite was shipped from Texada island to Vancouver for testing purposes.

*Platinum.*—Platinum occurs in irregular and variable amounts in the placer deposits of the Tulameen and Quesnel River sections. Small amounts of crude platinum were recovered in placer operations on the Tulameen river, the output being estimated at $960.

*Arsenic.*—From the arsenical-iron-gold concentrates of the *Nickel Plate* mine $60,898 worth of arsenic was recovered at the Tacoma smelter.

*Gypsum.*—Gypsum produced in 1927 was valued at $201,152, an increase of $46,080 over that of 1926. This relatively large output was made principally by the British Columbia Gypsum Company from its property at Falkland. A steady production is expected in the future by this company, which only started shipping in 1926.

*Sodium Carbonate.*—The production of sodium carbonate made in 1927 was valued at $9,995. The output was made by several shippers from small lakes in the Clinton Division. The mineral is shipped over the Pacific Great Eastern Railway for consumption in Vancouver and district.

*Silicate of Alumina.*—From a deposit near Williams Lake shipments of a refractory material, locally called kaolin, valued at $4,750, were made to Vancouver. This material was used as a refractory for furnace-linings and other purposes.

# DEPARTMENT OF MINES.

VICTORIA, B.C.

HON. W. H. SUTHERLAND - - - - - - *Minister of Mines.*
ROBERT DUNN - - - - - - - - - *Deputy Minister.*
JOHN D. GALLOWAY - - - - - *Provincial Mineralogist.*
D. E. WHITTAKER - - - - - *Provincial Analyst and Assayer.*
JAMES DICKSON - - - - - - *Chief Inspector of Mines.*

J. W. JEMSON, *District Inspector*, Nanaimo.
T. R. JACKSON, *District Inspector*, Nanaimo.
ROBERT STRACHAN, *District Inspector*, Fernie.
JOHN MACDONALD, *District Inspector*, Fernie.
JOHN G. BIGGS, *District Inspector*, Merritt.
THOS. J. SHENTON, *Dist. Inspector*, Prince Rupert.
H. H. JOHNSTONE, *Inspector*, Nelson.
JAS. STRANG, *Inspector and Examiner*, Victoria.
H. E. MIARD, *Inspector and Examiner*, Fernie.

*Resident Mining Engineers.*

H. T. JAMES, No. 1 District, Prince Rupert.
DOUGLAS LAY, No. 2 District, Hazelton.
H. G. NICHOLS, No. 3 District, Kamloops.
P. B. FREELAND, No. 4 District, Grand Forks.
A. G. LANGLEY, No. 5 District, Revelstoke.
GEO. A. CLOTHIER, No. 6 District, Nanaimo.

## DEPARTMENT OF MINES.

Mining in British Columbia is administered for the Government by the Department of Mines through the Deputy Minister of Mines and under the direction of the Honourable the Minister of Mines. The Department has charge of all Government offices in connection with the mining industry and, except as may be otherwise provided by Statute, the administration of the laws with respect to all kinds of mining.

Under the "Mineral Act" the Province is divided into forty-two Mining Divisions. Over each of these Divisions there is a Mining Recorder and over groups of Divisions of varying sizes there are Gold Commissioners. Of Mining Recorders, inclusive of Sub-Mining Recorders, there are 121, and of Gold Commissioners, 25. These figures give an insight into the extensive provision which has been made to assure prospectors and mining men generally that, wherever they may find themselves within British Columbia's 370,000 square miles of territory, they at all times will be within reasonable reach of a Mining Recorder, or a Deputy Mining Recorder, or a Gold Commissioner ready to extend to them all the privileges to which they are entitled, as free miners, under the "Mineral," "Placer," or other Mining Acts.

A sketch of the respective duties of the above-enumerated officers may be of interest. The Gold Commissioner in many cases also is Government Agent and in the latter capacity may represent every department of public service. Under the mining laws he has all the powers of a Mining Recorder and sometimes discharges the duties of both offices. One of his responsible duties is the issuing of certificates of improvement in respect of mineral claims for which Crown grants are sought; another is the consideration and the granting or otherwise of placer-mining leases; and in addition he has quasi-judicial authority in regard to questions which arise from time to time under both the "Mineral Act" and the "Placer-mining Act." A Gold Commissioner may have one or more Mining Divisions under his supervision.

As to Mining Recorders and Sub-Mining Recorders, the Acts clearly explain their duties. They are the officials first looked for on the discovery and location of placer-ground or mineral claims. They must see that all records are properly made and that the order of priority is carefully observed in respect of the same. They issue Free Miners' Certificates and must see that a proper return of the same is made to the Department.

It is this comprehensive system of administration which, broadly speaking, constitutes the Department of Mines, headquarters of which, under the Honourable the Minister of Mines, are in Victoria. From the head office the activities of the officers in the different parts of the Province

are directed and co-ordinated. Care must be given the application of the mining laws to divergent problems in order that, whilst justice is accorded in all cases, in none are the vital principles underlying the Statute departed from. This is one of the most important of the duties of the Department functioning under the direct supervision of the Minister.

There also is the duty of administering the "Mines Development Act," 1916, under the terms of which the sum of $1,060,000 was expended in the construction and the maintenance of mine roads, trails, and bridges from May 31st, 1916, to December 31st, 1927. As a result, mines, found upon inspection by Government Mining Engineers to merit assistance, have benefited by the building of 380 miles of road and 1,211 miles of trail and the maintenance of 1,988 miles of road and 6,422 miles of trail. This means that a grand total of 10,001 miles of roads and trails have been opened and kept open in order that the development of mining might be facilitated. This, then, is another phase of the work of the Department, which maintains its touch with the field through six Resident Mining Engineers appointed under the "Mineral Survey and Development Act."

All who are interested in mining in British Columbia should make themselves acquainted with the "Mineral Survey and Development Act." It is interesting not only because of the appointment of Resident Mining Engineers over six Mineral Survey Districts, who are required to apply themselves constantly to the making of a survey of the mineral resources of their respective districts, to prepare a report each year dealing with their activities and observations, and to extend every possible assistance to mining men and prospectors. There are other features; perhaps the most important, in view of recent increased public financial support of mining enterprises, being contained in sections 16 and 17 of the Act. Briefly these sections make it necessary for a mining company to forward a copy of its prospectus to the Resident Mining Engineer of the district in which its mining property is situated. The Engineer's duty is to compare statements contained in the prospectus with the conditions as he knows them to exist on the ground. If he finds misstatements or discrepancies calculated to mislead an investor, the Minister is notified. He makes further investigation. The company may be communicated with and asked to withdraw the statements complained of; or, if the case is one that seems to demand more extreme measures, the Minister may authorize the public advertisement of the facts through the Provincial Gazette and the public press.

The foregoing will serve to convey a general idea of the activities of the administrative headquarters of the Department in Victoria and those branch offices situated in the large centres of population as well as in the most remote parts of the Province over which jurisdiction is exercised.

If you want information as to the mining laws of the Province, apply to the Department. If you are contemplating investment in the stock of a British Columbia mining company, do not fail to get the last Annual Report of the Minister of Mines. References to practically every mine or mining prospect in British Columbia are contained in these Annual Reports. If no such references were made last year, the desired information may have been given in the Annual Report of some previous year. It is possible that the slight trouble of asking for a search will be well rewarded. The Department is prepared to render this service on application.

Communications from anywhere in Canada, the United States, or South America, seeking either copies of Annual Reports or mining maps, or any other information concerning mining in the Province, will have immediate attention if directed to:—

HON. W. H. SUTHERLAND,
*Minister of Mines,*
*Victoria, B.C.,*
*Canada.*

Applications for information, as above set out, from Great Britain, or any other European country, will receive prompt attention by being referred to the Agent-General for British Columbia, British Columbia House, 1 and 3 Regent Street, London, S.W. 1, England.

## INSPECTION BRANCH.

The Inspection Branch of the Department of Mines consists of a Chief Inspector, seven District Inspectors, two examiners, who are also Acting-Inspectors, and four Instructors in Mine-rescue Work.

The Inspectors have jurisdiction over both coal and metalliferous mines within the boundaries of their respective districts. Every part of all operating coal-mines are inspected at least once every month, and metalliferous mines as often as time will permit, generally once in every sixty days, to see that general conditions are good for the safety and health of the workmen employed, and that the Coal and Metalliferous Mines Regulation Acts are complied with.

The Mine-rescue Stations are under the jurisdiction of the Inspection Branch. Four are maintained at the principal mining centres for the purpose of supplementing, in case of need, the colliery installations of mine-rescue apparatus, and also for the purpose of training the holders of certificates in the use of mine-rescue apparatus. In cases of emergency these stations are available for the use of any trained corps of mine rescuers, duly qualified medical practitioners, or corps trained in the work of first aid to the injured, subject to the order of an Inspector. All certificated officials who are physically fit, and not less than 3 per cent., or such number as the Chief Inspector may deem sufficient, of the workmen at each colliery must be trained in the use of mine-rescue apparatus.

The examining boards for granting certificates of competency to coal-mine officials and coal-miners are under the jurisdiction of the Inspection Branch. The Chief Inspector and the two examiners form the board for coal-mine officials for the whole of the Province, and the two examiners and the District Inspector form the board for granting certificates to coal-miners within their respective districts.

A District Inspector may grant a provisional certificate to a coal-miner between examinations for a period not exceeding sixty days.

Blasting certificates of competency to miners at metalliferous mines are granted by the Inspector of Mines.

A section of the Annual Report of the Minister of Mines contains the reports of the officials of the Inspection Branch.

## GOLD COMMISSIONERS AND MINING RECORDERS.

| Mining Division. | Location of Office. | Gold Commissioner. | Mining Recorder. | Sub-Recorder. |
|---|---|---|---|---|
| Atlin | Atlin | C. L. Monroe | C. L. Monroe | J. G. Garrett. |
| Sub-office | Telegraph Creek | | | H. W. Dodd. |
| Sub-office | Haines (U.S.) | | (Com. for taking Affidavits) | Risdon M. Odell. |
| Sub-office | Juneau (U.S.) | | Ditto | Harold E. Brown. |
| Stikine | Telegraph Creek | H. W. Dodd | H. W. Dodd | |
| Sub-office | Boundary | | | W. R. Overend. |
| Liard | Telegraph Creek | H. W. Dodd | H. W. Dodd | |
| Sub-office | Porter | | | Chas. H. Smith. |
| Sub-office | McDame Creek | | | Mike Larsen. |
| Sub-office | Fort St. John | | | F. W. Beatton. |
| Skeena | Prince Rupert | N. A. Watt | N. A. Watt | |
| Sub-office | Kitimat | | | C. M. Carlson. |
| Sub-office | Copper City | | | L. G. Skinner. |
| Sub-office | Terrace | | | L. H. Kenny. |
| Sub-office | Rosswood | | | Mrs. C. Warner. |
| Sub-office | Stewart (Portland Canal) | | | J. P. Scarlett. |
| Nass River | Anyox | N. A. Watt | R. M. McGusty | |
| Sub-office | Aiyansh | | | A. F. Priestly. |
| Sub-office | Alice Arm | | | Mrs. L. Cummings. |
| Portland Canal | Stewart | N. A. Watt (at Prince Rupert) | J. P. Scarlett | |
| Bella Coola | Prince Rupert | N. A. Watt | N. A. Watt | |
| Sub-office | Bella Coola | | | Brynild Brynildsen. |
| Sub-office | Bella Bella | | | |
| Sub-office | Ocean Falls | | | Geo. H. Hill. |
| Queen Charlotte | Queen Charlotte | N. A. Watt | John L. Barge | |
| Sub-office | Jedway | | | Isaac Thompson. |
| Sub-office | Masset | | | J. C. S. Dunn, M.D. |
| Sub-office | Lockeport | | | S. Wermig. |
| Omineca | Smithers | Stephen H. Hoskins | Jas. E. Kirby | |
| Sub-office | Fort Grahame | | | T. A. Perry (Acting). |
| Sub-office | Finlay Forks | | | Ole Johnson. |

GOLD COMMISSIONERS AND MINING RECORDERS—*Continued.*

| Mining Division. | Location of Office. | Gold Commissioner. | Mining Recorder. | Sub-Recorder. |
|---|---|---|---|---|
| Omineca—*Continued.* | | | | |
| Sub-office | Fort St. James | | | Alex. C. Murray. |
| Sub-office | Manson Creek | | | W. B. Steele. |
| Sub-office | Telkwa | | | T. J. Thorp. |
| Sub-office | Prince George | | | Geo. Milburn. |
| Sub-office | Hudson Hope | | | J. L. Ruxton (Acting). |
| Sub-office | Fort St. John | | | F. W. Beatton. |
| Sub-office | Copper City | | | L. G. Skinner. |
| Sub-office | Terrace | | | L. H. Kenny. |
| Sub-office | Fort Fraser | | | J. D. Moore. |
| Sub-office | Pacific | | | T. H. McCubbin. |
| Sub-office | Hazelton | | | G. A. Wyman. |
| Sub-office | Burns Lake | | | S. Godwin. |
| Sub-office | Usk | | | Jas. L. Bethurem. |
| Sub-office | Tatla Landing | | | E. G. McCorkell. |
| Peace River | Fort St. John | S. H. Hoskins (at Smithers) | F. W. Beatton | |
| Sub-office | Prince George | | | G. Milburn. |
| Sub-office | Finlay Forks | | | Ole Johnson. |
| Sub-office | Hudson Hope | | | J. L. Ruxton (Acting). |
| Sub-office | Pouce Coupe | | | Fred. Fraser. |
| Cariboo | Barkerville | L. J. Price | L. J. Price | Mrs. L. J. Price. |
| Sub-office | Quesnel | L. J. Price | | E. C. Lunn. |
| Sub-office | Prince George | L. J. Price | | Geo. Milburn. |
| Sub-office | McBride | L. J. Price | | L. R. P. Dickson. |
| Quesnel | Williams Lake | L. C. Maclure | L. C. Maclure | |
| Sub-office | Quesnel | | | E. C. Lunn. |
| Sub-office | Likely | | | A. B. Campbell. |
| Sub-office | Barkerville | | | L. J. Price. |
| Clinton | Clinton | R. J. A. Dorrell | R. J. A. Dorrell | |
| Sub-office | Williams Lake | | | L. C. Maclure. |
| Sub-office | S. Fork, Bridge River | | | W. Haylmore. |
| Sub-office | Taseko Lake | | | Herbert Hunter. |
| Lillooet | Lillooet | E. F. Little | E. F. Little | R. W. Melton. |
| Sub-office | S. Fork, Bridge River | | | W. Haylmore. |
| Kamloops | Kamloops | E. Fisher | E. Fisher | R. F. Ure. |
| Sub-office | Chu Chua | | | George Fennell. |
| Sub-office | Vavenby | | | H. Finley. |
| Ashcroft | Ashcroft | E. Fisher (at Kam.) | W. C. Adams | F. H. C. Wilson. |
| Sub-office | Lytton | | | W. Greenwood. |
| Nicola | Merritt | E. Fisher (at Kam.) | R. G. Cowper | |
| Yale | Yale | E. Fisher (at Kam.) | | |
| Sub-office | Hope | | D. A. Hazelton | Mrs. D. A. Hazelton. |
| Similkameen | Princeton | L. A. Dodd | L. A. Dodd | |
| Sub-office | Hedley | | | R. E. Baxter. |
| Vernon | Vernon | R. Ross Napier | R. Ross Napier | |
| Greenwood | Greenwood | S. B. Hamilton | S. B. Hamilton | |
| Sub-office | Vernon | | | |
| Sub-office | Rock Creek | | | Owen Wheeler. |
| Sub-office | Beaverdell | | | D. R. McElmon. |
| Grand Forks | Grand Forks | Chas. Mudge | Chas. Mudge | |
| Osoyoos | Penticton | W. R. Dewdney | W. R. Dewdney | |
| Sub-office | Keremeos | | | L. H. Patten. |
| Sub-office | Hedley | | | R. E. Baxter. |
| Sub-office | Fairview | | | J. R. Brown. |
| Golden | Golden | G. E. Sanborn | G. E. Sanborn | H. C. Moore. |
| Windermere | Wilmer | G. E. Sanborn (at Golden) | E. M. Sandilands | |
| Fort Steele | Cranbrook | P. H. McCurrach | P. H. McCurrach | |
| Sub-office | Fernie | | | E. T. Cope. |
| Ainsworth | Kaslo | Ronald Hewat | A. McQueen | A. W. Anderson. |
| Sub-office | Howser | | | J. F. Thompson. |
| Sub-office | Trout Lake | | | Roy V. Jacobson. |
| Sub-office | Poplar | | | Arthur G. Johnston. |

GOLD COMMISSIONERS AND MINING RECORDERS—*Continued.*

| Mining Division. | Location of Office. | Gold Commissioner. | Mining Recorder. | Sub-Recorder. |
|---|---|---|---|---|
| Slocan | New Denver | Ronald Hewat (at Kaslo) | Angus McInnes | |
| Sub-office | Sandon | | | W. J. Parham. |
| Slocan City | Slocan | Ronald Hewat | T. McNeish | |
| Trout Lake | Trout Lake | Ronald Hewat | Roy V. Jacobson | |
| Nelson | Nelson | J. Cartmel | J. Cartmel | |
| Sub-office | Creston | | | H. W. McLaren. |
| Sub-office | Ymir | | | Wm. Clark. |
| Sub-office | Salmo | | | M. C. Donaldson. |
| Arrow Lake | Nakusp | J. Cartmel (at Nelson) | Walter Scott | |
| Sub-office | Vernon | | | R. Ross Napier. |
| Revelstoke | Revelstoke | Wynfield Maxwell | C. J. Aman | |
| Lardeau | Beaton | Wynfield Maxwell (at Revelstoke) | Ernest Roberts | |
| Trail Creek | Rossland | W. H. Reid | W. H. Reid | |
| Nanaimo | Nanaimo | W. H. Boothroyd | W. H. Boothroyd | |
| Sub-office | Ladysmith | | | J. A. Knight. |
| Sub-office | Alert Bay | | | Ernest H. Robinson. |
| Sub-office | Vananda | | | Leonard Raper. |
| Sub-office | Granite Bay | | | Henry Twidle. |
| Alberni | Alberni | A. G. Freeze | A. G. Freeze | |
| Clayoquot | Clayoquot | A. G. Freeze (at Alberni) | W. T. Dawley | |
| Quatsino | Quatsino | A. G. Freeze (at Alberni) | Ed. Evensen | |
| Victoria | Victoria | R. J. Steenson | R. J. Steenson | |
| New Westminster | New Westminster | F. C. Campbell | A. B. Gray | |
| Sub-office | Harrison Lake | | | L. A. Agassiz. |
| Sub-office | Chilliwack | | | Chas. J. Whittaker. |
| Vancouver | Vancouver | John Mahony | A. P. Grant | |

# OFFICE STATISTICS FOR MINING DIVISIONS.

## NORTH-WESTERN DISTRICT (No. 1).

### ATLIN MINING DIVISION.

REPORT OF C. L. MONROE, GOLD COMMISSIONER, ATLIN.

I have the honour to submit the office statistics of the Atlin Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates (individual) | 343 |
| Free miners' certificates (company) | 4 |
| Free miners' certificates (special) | 2 |
| Placer records | 64 |
| Mineral records | 33 |
| Placer rerecords | 98 |
| Placer lease applications | 16 |
| Placer leases granted | 7 |
| Certificates of work (leases) | 114 |
| Certificates of work (mineral) | 143 |
| Leaves of absence | 11 |
| Bills of sale, etc. (placer) | 13 |
| Bills of sale, etc. (hydraulic) | 66 |
| Bills of sale, etc. (mineral) | 31 |
| Certificates of improvements | 15 |
| Filings | 16 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $1,901.00 |
| Mining receipts | 7,107.27 |
| Total | $9,008.27 |

### STIKINE AND LIARD MINING DIVISIONS.

REPORT BY H. W. DODD, GOLD COMMISSIONER, TELEGRAPH CREEK.

I have the honour to submit the office statistics of the Stikine and Liard Mining Divisions for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates (individual) | 222 |
| Free miners' certificates (company) | 3 |
| Placer claims recorded | 7 |
| Placer claims rerecorded | 23 |
| Mineral claims recorded | 25 |
| Placer leases issued | 21 |
| Certificates of work (placer) | 24 |
| Certificates of work (mineral) | 19 |
| Agreements and bills of sale | 37 |
| Powers of attorney | 34 |
| Filings | 4 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $1,306.25 |
| Mining receipts | 8,893.50 |
| Total | $10,199.75 |

## SKEENA AND BELLA COOLA MINING DIVISIONS.

REPORT BY NORMAN A. WATT, GOLD COMMISSIONER, PRINCE RUPERT.

I have the honour to submit the office statistics of the Skeena and Bella Coola Mining Divisions for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates issued | 239 |
| Mining receipts issued | 135 |
| Mineral claims recorded | 98 |
| Placer claims recorded | 3 |
| Mining leases issued (section 180, "Taxation Act") | 2 |
| Certificates of work issued (mining) | 140 |
| Certificates of work issued (placer) | 1 |
| Filings | 26 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $1,327.25 |
| Mining receipts | 1,063.25 |
| Total | $2,390.50 |

## NASS RIVER MINING DIVISION.

REPORT BY R. M. MCGUSTY, MINING RECORDER, ANYOX.

I have the honour to submit the office statistics of the Nass River Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates | 184 |
| Mineral claims recorded | 87 |
| Certificates of improvements | 10 |
| Certificates of work (mineral) | 472 |
| Conveyances | 55 |
| Filings | 33 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $1,238.25 |
| Mining receipts | 2,337.70 |
| Total | $3,575.95 |

## PORTLAND CANAL MINING DIVISION.

REPORT BY J. P. SCARLETT, MINING RECORDER, STEWART.

I have the honour to submit the office statistics of the Portland Canal Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates (individual) | 369 |
| Free miners' certificates (company) | 12 |
| Free miners' certificates (special) | 2 |
| Mineral claims recorded | 691 |
| Certificates of work issued | 1,312 |
| Bills of sale, etc., recorded | 312 |
| Certificates of improvements recorded | 100 |
| Abandonments | 8 |
| Filings | 107 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $3,019.75 |
| Mining receipts | 9,905.45 |
| Total | $12,925.20 |

## QUEEN CHARLOTTE MINING DIVISION.

REPORT BY JOHN L. BARGE, MINING RECORDER, QUEEN CHARLOTTE.

I have the honour to submit the office statistics of the Queen Charlotte Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates issued | 41 |
| Mineral records (locations) (quartz) | 32 |
| Mineral records (locations) (placer) | 2 |
| Certificates of work (quartz) | 16 |
| Certificates of work (placer) | 6 |
| Records, bills of sale, powers of attorney, etc. | 8 |

*Revenue.*

| | |
|---|---|
| Mining receipts | $297.75 |
| Free miners' certificates | 178.75 |
| Total | $476.50 |

# NORTH-EASTERN DISTRICT (No. 2).

## CARIBOO MINING DIVISION.

REPORT BY L. J. PRICE, GOLD COMMISSIONER, BARKERVILLE.

I have the honour to submit the office statistics of the Cariboo Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates (ordinary) | 546 |
| Free miners' certificates (company) | 18 |
| Free miners' certificates (special) | 5 |
| Mineral claims recorded | 87 |
| Certificates of improvements issued | 6 |
| Certificates of work recorded (mineral) | 95 |
| Placer claims recorded and rerecorded | 22 |
| Placer-mining leases issued | 52 |
| Certificates of work recorded (leases) | 99 |
| Powers of attorney recorded | 23 |
| Conveyances and agreements recorded (placer) | 29 |
| Conveyances and agreements recorded (mineral) | 22 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $2,441.75 |
| Mining receipts | 10,294.22 |
| Total | $12,735.97 |

## QUESNEL MINING DIVISION.

REPORT BY L. C. MACLURE, GOLD COMMISSIONER, WILLIAMS LAKE.

I have the honour to submit the office statistics of the Quesnel Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates issued (individual) | 275 |
| Free miners' certificates issued (special) | 1 |
| Mineral claims recorded | 36 |
| Placer claims recorded | 6 |
| Relocations recorded | 5 |
| Applications for placer-mining leases | 45 |
| Placer-mining leases issued | 58 |

| | |
|---|---|
| Placer-mining leases in force | 229 |
| Certificates of work (placer) | 150 |
| Certificates of work (mineral) | 55 |
| Conveyances, agreements, etc., recorded | 51 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $1,384.00 |
| Mining receipts, general | 7,820.20 |
| Total | $9,204.20 |

### OMINECA MINING DIVISION.

REPORT BY S. H. HOSKINS, GOLD COMMISSIONER, SMITHERS.

I have the honour to submit the office statistics of the Quesnel Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates issued (ordinary) | 713 |
| Free miners' certificates issued (company) | 8 |
| Free miners' certificates issued (special) | 5 |
| Mineral claims recorded | 838 |
| Certificates of work issued (mineral) | 856 |
| Certificates of work issued (placer) | 31 |
| Placer claims recorded and rerecorded | 6 |
| Bills of sale, mining agreements, options, etc. | 352 |
| Powers of attorney recorded | 31 |
| Mining documents filed | 75 |
| Applications for placer-mining leases (Omineca Division) | 1 |
| Placer-mining leases issued (Omineca Division) | 1 |
| Applications for placer-mining leases (Peace River Division) | 1 |
| Placer-mining leases issued (Peace River Division) | 1 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $4,241.25 |
| Mining receipts | 7,295.80 |
| Total | $11,537.05 |

## CENTRAL DISTRICT (No. 3).

### LILLOOET MINING DIVISION.

REPORT BY E. F. LITTLE, GOLD COMMISSIONER, LILLOOET.

I have the honour to submit the office statistics of the Lillooet Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates (individual) | 136 |
| Free miners' certificates (company) | 4 |
| Free miners' certificates (special) | 2 |
| Mineral claims recorded | 104 |
| Certificates of work recorded (mineral) | 188 |
| Certificates of work recorded (placer) | 40 |
| Placer-mining leases issued | 13 |
| Notices to group | 20 |
| Crown-granted mineral claims leased | 18 |
| Powers of attorney recorded | 13 |
| Bills of sale, mining agreements, etc., recorded | 22 |
| Mineral claims in existence | 289 |
| Placer leases in existence | 69 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $1,158.25 |
| Mining receipts | 3,774.65 |
| Total | $4,932.90 |

## CLINTON MINING DIVISION.

REPORT BY R. A. DORRELL, GOLD COMMISSIONER, CLINTON.

I have the honour to submit the office statistics of the Clinton Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates | 49 |
| Mineral claims recorded | 45 |
| Certificates of work | 66 |
| Placer claims recorded | 2 |
| Leases issued | 14 |
| Bench leases in existence | 13 |
| Creek leases in existence | 2 |
| Dredging leases in existence | 3 |
| "Mineral Act," bills of sale, etc. | 16 |
| "Placer Act," assignments, etc. | 13 |
| Certificates of work (placer) | 1 |
| Notices to group | 3 |
| Filings | 8 |
| Revocation of powers of attorney | 2 |
| Special free miners' certificates | 30 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $698.50 |
| Mining receipts, general | 1,614.05 |
| Total | $2,312.55 |

## NICOLA MINING DIVISION.

REPORT BY R. G. COWPER, MINING RECORDER, MERRITT.

I have the honour to submit the office statistics of the Nicola Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates | 83 |
| Mineral claims recorded | 45 |
| Certificates of work (mineral) | 51 |
| Certificates of work (placer) | 8 |
| Bills of sale (mineral) | 4 |
| Bills of sale (placer) | 7 |
| Powers of attorney | 7 |
| Agreements recorded (mineral) | 4 |
| Agreements recorded (placer) | 1 |
| Placer leases issued | 14 |
| Notices to group | 11 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $383.25 |
| Mining receipts, general | 1,215.70 |
| Total | $1,598.95 |

## VERNON MINING DIVISION.

REPORT BY R. ROSS NAPIER, GOLD COMMISSIONER, VERNON.

I have the honour to submit the office statistics of the Vernon Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates issued (individual) | 190 |
| Free miners' certificates issued (special) | 2 |
| Mineral claims recorded | 67 |
| Certificates of work issued (mineral) | 51 |
| Certificates of work issued (placer) | 11 |
| Placer-mining leases in force | 22 |
| Applications (placer-mining leases) | 9 |
| Powers of attorney recorded | 2 |
| Conveyances and agreements recorded | 18 |
| Certificates of improvements | 4 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $997.50 |
| Mining receipts, general | 1,381.35 |
| Total | $2,378.85 |

## YALE MINING DIVISION.

REPORT BY D. A. HAZELTON, MINING RECORDER, HOPE.

I have the honour to submit the office statistics of the Yale Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates (ordinary) | 161 |
| Free miners' certificates (company) | 5 |
| Mineral claims recorded | 59 |
| Placer claims recorded | 7 |
| Certificates of work (mineral) | 163 |
| Certificates of work (placer) | 26 |
| Placer leases in existence | 30 |
| Bills of sale recorded (mineral) | 18 |
| Bills of sale recorded (placer) | 3 |
| Filings | 17 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $1,158.50 |
| Mining receipts | 2,128.15 |
| Total | $3,286.65 |

## ASHCROFT MINING DIVISION.

REPORT BY W. C. ADAM, MINING RECORDER, ASHCROFT.

I have the honour to submit the office statistics of the Ashcroft Mining Division for the year ended December 31st, 1927.

"Mineral Act"—

| | |
|---|---|
| Certificates of work | 32 |
| Claims recorded | 63 |
| Powers of attorney recorded | 4 |
| Bills of sale recorded | 7 |
| Agreements recorded | 2 |

"Mineral Act"—*Continued.*

| | |
|---|---|
| Free miners' certificates issued | 98 |
| Grouping | 4 |
| Unworked Crown-granted mineral claims in good standing | 49 |

"Placer Act"—

| | |
|---|---|
| Claims recorded | 3 |
| Placer leases | 5 |
| Certificates of work | 1 |

*Revenue.*

| | |
|---|---|
| Total receipts | $1,633.25 |

## KAMLOOPS MINING DIVISION.

REPORT BY E. FISHER, GOLD COMMISSIONER, KAMLOOPS.

I have the honour to submit the office statistics of the Kamloops Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates | 390 |
| Mineral claims recorded | 149 |
| Mineral claims (partnership) | 24 |
| Placer rerecords | 2 |
| Placer leases issued | 1 |
| Certificates of work (mineral) | 293 |
| Certificates of work (placer) | 27 |
| Bills of sale, etc. | 26 |
| Filings | 47 |

*Revenue.*

| | |
|---|---|
| Mining receipts | $2,315.35 |
| Free miners' certificates | 2,296.20 |
| Total | $4,611.55 |

# SOUTHERN DISTRICT (No. 4).

## GREENWOOD MINING DIVISION.

REPORT BY S. B. HAMILTON, GOLD COMMISSIONER, GREENWOOD.

I have the honour to submit the office statistics of the Greenwood Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates | 142 |
| Locations (quartz) | 50 |
| Locations (placer) | 3 |
| Certificates of work (quartz) | 169 |
| Leases (placer) | 1 |
| Bills of sale, agreements, etc. | 15 |
| Certificates of improvements | 1 |
| Leases of reverted Crown-granted mineral claims | 35 |
| Notices to group mineral claims, etc. | 28 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $728.50 |
| Mining receipts, general | 1,607.40 |
| Total | $2,335.90 |

## GRAND FORKS MINING DIVISION.

REPORT BY CHAS. MUDGE, MINING RECORDER, GRAND FORKS.

I have the honour to submit the office statistics of the Grand Forks Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates | 84 |
| Records of locations (mining) | 46 |
| Records of locations (placer) | 1 |
| Certificates of work (mining) | 67 |
| Bills of sale | 15 |
| Filings | 4 |
| Certificates of improvements | 3 |
| Crown grants | 3 |
| Leases of reverted mineral claims | 13 |

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## OSOYOOS MINING DIVISION.

REPORT BY W. R. DEWDNEY, GOLD COMMISSIONER, PENTICTON.

I have the honour to submit the office statistics of the Osoyoos Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates (ordinary) | 141 |
| Free miners' certificates (special) | 3 |
| Locations (quartz) | 40 |
| Certificates of work (mineral) | 73 |
| Conveyances | 9 |
| Agreements | 2 |
| Leases of reverted claims | 7 |
| Filings | 11 |

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## SIMILKAMEEN MINING DIVISION.

REPORT BY L. A. DODD, GOLD COMMISSIONER, PRINCETON.

I have the honour to submit the office statistics of the Princeton Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates | 33 |
| Mineral claims recorded | 229 |
| Certificates of work (mineral) | 247 |
| Certificates of work (leases) | 111 |
| Conveyances, etc. (mineral) | 80 |
| Conveyances, etc. (placer) | 67 |
| Powers of attorney recorded | 38 |
| Placer leases issued | 50 |
| Placer leases in force | 150 |
| Reverted mineral claims Crown-granted | 29 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $2,055.25 |
| Mining receipts | 7,620.95 |
| Total | $9,676.20 |

# EASTERN DISTRICT (No. 5).

## GOLDEN MINING DIVISION.

REPORT BY G. E. SANBORN, GOLD COMMISSIONER, GOLDEN.

I have the honour to submit the office statistics of the Golden Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates (ordinary) | 152 |
| Free miners' certificates (special) | 1 |
| Mineral claims recorded | 43 |
| Placer leases issued | 7 |
| Certificates of work (mineral) | 92 |
| Certificates of work (placer) | 13 |
| Bills of sale, agreements, etc. | 20 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $679.00 |
| Mining receipts | 2,466.75 |
| Total | $3,145.75 |

## WINDERMERE MINING DIVISION.

REPORT BY E. M. SANDILANDS, MINING RECORDER, WILMER.

I have the honour to submit the office statistics of the Windermere Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates issued (ordinary) | 103 |
| Claims recorded (quartz) | 73 |
| Placer leases (dredge) | 2 |
| Certificates of work (quartz) | 141 |
| Certificates of improvements | 20 |
| Bills of sale, bonds, powers of attorney, agreements, etc. | 21 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $579.25 |
| Mining receipts | 2,750.65 |
| Total | $3,329.90 |

## FORT STEELE MINING DIVISION.

REPORT BY P. H. MCCURRACH, GOLD COMMISSIONER, CRANBROOK.

I have the honour to submit the office statistics of the Fort Steele Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates | 340 |
| Locations recorded (quartz) | 208 |
| Certificates of work (quartz) | 1,040 |
| Placer claims rerecorded | 2 |
| Placer leases issued | 3 |
| Certificates of work (placer) | 11 |
| Bills of sale, agreements, etc. | 120 |
| Filings | 48 |
| Leases of reverted Crown-granted mineral claims | 18 |
| Applications for leases under "Phosphate-mining Act" | 46 |
| Certificates of improvements issued | 127 |

## REVELSTOKE MINING DIVISION.

REPORT BY CHARLES J. AMAN, MINING RECORDER, REVELSTOKE.

I have the honour to submit the office statistics of the Revelstoke Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates | 132 |
| Free miners' certificates (company) | 2 |
| Locations recorded | 27 |
| Certificates of work issued | 196 |
| Leases of Crown-granted mineral claims | 9 |
| Placer claims recorded | 5 |
| Groupings recorded | 10 |
| Bills of sale, agreements, and powers of attorney | 40 |

*Revenue.*

| | |
|---|---|
| Mining receipts, general | $1,659.95 |
| Free miners' certificates | 983.50 |
| Crown grants to reverted claims | 545.45 |
| Total | $3,188.90 |

## LARDEAU MINING DIVISION.

REPORT BY E. ROBERTS, MINING RECORDER, BEATON.

I have the honour to submit the office statistics of the Lardeau Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates issued | 55 |
| Free miners' certificates issued (company) | 3 |
| Certificates of work | 100 |
| Locations recorded | 54 |
| Bills of sale | 15 |
| Grouping notices | 13 |
| Agreement of option | 1 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $267.00 |
| Free miners' certificates (company) | 250.00 |
| Certificates of work | 250.00 |
| Locations recorded | 135.00 |
| Bills of sale | 37.50 |
| Grouping notices | 3.25 |
| Agreement of option | 3.70 |
| Certificates of improvements (two) | 5.00 |
| Recording work after time elapsed (two) | 20.00 |
| Total | $971.45 |

## AINSWORTH MINING DIVISION.

REPORT BY RONALD HEWAT, GOLD COMMISSIONER, KASLO.

I have the honour to submit the office statistics of the Ainsworth Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates | 231 |
| Mineral claims recorded | 135 |
| Certificates of work recorded | 260 |
| Bills of sale, agreements, etc. | 26 |
| Dredging leases issued | 1 |
| Leases of reverted Crown-granted mineral claims issued | 28 |

## SLOCAN MINING DIVISION.

REPORT BY ANGUS MCINNES, MINING RECORDER, NEW DENVER.

I have the honour to submit the office statistics of the Ainsworth Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates issued | 137 |
| Mineral claims recorded | 43 |
| Certificates of work issued | 110 |
| Transfers recorded | 15 |

## SLOCAN CITY MINING DIVISION.

REPORT BY THOS. MCNEISH, MINING RECORDER, SLOCAN.

I have the honour to submit the office statistics of the Slocan City Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates issued | 49 |
| Locations recorded | 32 |
| Certificates of work issued | 65 |
| Bills of sale | 5 |
| Notices to group | 6 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $238.00 |
| Mining receipts, general | 456.50 |
| Total | $694.50 |

## TROUT LAKE MINING DIVISION.

REPORT BY R. V. JACOBSON, MINING RECORDER, TROUT LAKE.

I have the honour to submit the office statistics of the Trout Lake Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates | 50 |
| Mineral claims recorded | 49 |
| Placer claims recorded | 5 |
| Conveyances and agreements | 29 |
| Certificates of work issued | 143 |
| Notices to group | 27 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $243.50 |
| Mining receipts | 697.15 |
| Total | $940.65 |

## NELSON MINING DIVISION.

REPORT BY J. CARTMEL, GOLD COMMISSIONER, NELSON.

I have the honour to submit the office statistics of the Nelson Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates (individual) | 543 |
| Free miners' certificates (company) | 10 |
| Claims recorded (mineral) | 313 |
| Claims rerecorded (placer) | 3 |
| Certificates of work issued (mineral) | 405 |
| Certificates of work issued (placer leases) | 2 |
| Placer leases issued | 7 |

| | |
|---|---|
| Agreements of sale, transfers, etc. | 118 |
| Grouping notices filed | 31 |
| Certificates of improvements issued | 8 |
| Leases of forfeited Crown-granted mineral claims issued | 33 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $2,925.25 |
| Mining receipts | 2,839.25 |
| Mining receipts (lease fees, forfeited Crown-granted mineral claims) | 825.00 |
| Total | $6,589.50 |

## ARROW LAKE MINING DIVISION.

REPORT BY WALTER SCOTT, MINING RECORDER, NAKUSP.

I have the honour to submit the office statistics of the Arrow Lake Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates | 33 |
| Certificates of work | 27 |
| Mineral claims recorded | 17 |
| Options to purchase | 2 |

## TRAIL CREEK MINING DIVISION.

REPORT BY W. H. REID, GOLD COMMISSIONER, ROSSLAND.

I have the honour to submit the office statistics of the Trail Creek Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates (individual) | 108 |
| Free miners' certificates (company) | 4 |
| Locations | 28 |
| Affidavits of work | 62 |
| Bills of sale | 8 |
| Notices to group | 2 |
| Leases of reverted mineral claims | 3 |
| Certificates of improvements | 2 |

# WESTERN DISTRICT (No. 6).

## ALBERNI MINING DIVISION.

REPORT BY A. G. FREEZE, GOLD COMMISSIONER, ALBERNI.

I have the honour to submit the office statistics of the Alberni Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Mineral claims recorded | 7 |
| Certificates of work recorded | 6 |
| Free miners' certificates issued | 39 |
| Leases of reverted Crown-granted claims | 6 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $159.25 |
| Mining receipts, general | 482.50 |
| Total | $641.75 |

## CLAYOQUOT MINING DIVISION.

Report by S. J. Grant, Acting Mining Recorder, Clayoquot.

I have the honour to submit the office statistics of the Clayoquot Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Mineral claims recorded | 14 |
| Certificates of work issued | 18 |
| Bills of sale | 1 |
| Free miners' certificates issued | 10 |
| Special free miners' certificates issued | 1 |
| Mining receipts issued | 24 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $45.50 |
| Special free miners' certificates | 15.00 |
| Mining receipts | 101.00 |
| Total | $161.50 |

## QUATSINO MINING DIVISION.

Report by Ed. Evenson, Mining Recorder, Quatsino.

I have the honour to submit the office statistics of the Quatsino Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Mineral claims recorded | 81 |
| Certificates of work recorded | 32 |
| Bills of sale recorded | 25 |
| Powers of attorney | 1 |
| Group notices on file | 2 |
| Free miners' certificates | 40 |

*Revenue.*

| | |
|---|---|
| Total revenue collected | $515.00 |

## NANAIMO MINING DIVISION.

Report by W. H. Boothroyd, Gold Commissioner, Nanaimo.

I have the honour to submit the office statistics of the Quatsino Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates | 136 |
| Mineral claims recorded | 124 |
| Certificates of work | 175 |
| Bills of sale recorded | 74 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $913.00 |
| Mining receipts, general | 1,219.25 |
| Total | $2,132.25 |

## VICTORIA MINING DIVISION.

Report by R. J. Steenson, Gold Commissioner, Victoria.

I have the honour to submit the office statistics of the Victoria Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates issued (individual) | 330 |
| Free miners' certificates issued (company) | 23 |
| Free miners' certificates issued (special) | 4 |

| | |
|---|---|
| Mineral claims recorded | 55 |
| Certificates of work recorded | 42 |
| Placer claims recorded | 3 |
| Placer leases issued | 4 |
| Leases of reverted Crown-granted mineral claims | 9 |
| Grouping notices filed | 2 |
| Bills of sale recorded | 2 |
| Powers of attorney recorded | 2 |
| Lay-overs of placer claims | 2 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $3,676.00 |
| Mining receipts, general | 762.81 |
| Total | $4,438.81 |

---

## VANCOUVER MINING DIVISION.

REPORT BY A. P. GRANT, MINING RECORDER, VANCOUVER.

I have the honour to submit the office statistics of the Vancouver Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates issued | 1,578 |
| Free miners' certificates issued (company) | 68 |
| Free miners' certificates issued (special) | 18 |
| Quartz claims recorded | 55 |
| Certificates of work recorded | 151 |
| Grouping notices and documents filed | 22 |
| Conveyances recorded | 17 |
| Powers of attorney recorded | 1 |

*Revenue.*

| | |
|---|---|
| Mining receipts | $579.10 |
| Free miners' certificatees | 12,167.00 |
| Total | $12,746.10 |

---

## NEW WESTMINSTER MINING DIVISION.

REPORT BY A. B. GRAY, DEPUTY MINING RECORDER, NEW WESTMINSTER.

I have the honour to submit the office statistics of the New Westminster Mining Division for the year ended December 31st, 1927.

| | |
|---|---|
| Free miners' certificates issued | 207 |
| Mineral claims recorded | 85 |
| Placer claims recorded | 2 |
| Certificates of work issued | 84 |
| Conveyances, etc., recorded | 20 |
| Grouping notices filed | 11 |

*Revenue.*

| | |
|---|---|
| Free miners' certificates | $961.75 |
| Mining receipts | 682.15 |
| Total | $1,643.90 |

# BUREAU OF MINES.

REPORT BY JOHN D. GALLOWAY, PROVINCIAL MINERALOGIST.

The permanent staff of the Bureau of Mines consists of John D. Galloway, Provincial Mineralogist; D. E. Whittaker, Provincial Analyst and Provincial Assayer; J. B. Adams, Laboratory Assistant; H. T. Nation, general office assistant; and H. Pearson, clerk.

The Bureau of Mines is a branch of the Department of Mines, which collects, compiles, and supplies to the public much technical information regarding mining and mineral properties in the Province. At the close of each year the Annual Report of the Minister of Mines is prepared by the staff of the Bureau under the supervision of the Provincial Mineralogist. This Annual Report contains detailed statistics of mineral production compiled by the Bureau, reports by each of the six Resident Mining Engineers on their respective districts, and the reports of the Inspection Branch. The reports of the Resident Engineers have also been printed as separate bulletins for the years 1924, 1925, 1926, and 1927. Special bulletins descriptive of mining are issued at intervals.

The Bureau has a well-equipped Assay and Analytical Laboratory. Mineral and rock samples are examined qualitatively without charge. This is done for the purpose of encouraging the search for new mineral-bearing areas and to assist prospectors and others by enabling them to have determined, free of cost, the nature and probable value of any rock they may find.

The Bureau also has an excellent and comprehensive collection of British Columbia ores and mineral samples on exhibit for the public in its Mineral Museum.

With greater activity in mining the work of the Bureau has increased considerably during recent years. The routine work of the office consists of supplying to the public much information regarding mining in the Province, directing prospectors to promising areas, supplying statistical information, interdepartmental reports, etc.

During the field season of 1927 the Provincial Mineralogist made a number of special examinations involving field-trips in the southern interior and northern sections of the Province.

By arrangement with the Dominion Bureau of Statistics the British Columbia Bureau of Mines collects all Provincial mineral statistics required by both Bureaus. By this arrangement the mine-owner is only required to fill out one form in duplicate instead of making two separate returns as heretofore.

An agreement has also been reached whereby the same average metal prices will be used by both Bureaus in valuing the outputs of metals. The chief divergence in the past has been in adopting different market quotations for lead and zinc, but in future the same prices will be used.

At the present time the practice of the Dominion Bureau is to use refinery and smelter production to arrive at the yearly output of metals: the British Columbia Bureau uses mine production figures. This of course causes a difference in the yearly quantities of metals produced as reported by the two Bureaus, but the variation is only slight. The method in use by the British Columbia Bureau of Mines has been followed for many years and was adopted in order to compile the mineral production for the Province by Mining Divisions and Districts. These detailed statistics of mineral production are shown in the Annual Reports of the Minister of Mines in comprehensive sets of tables. It is believed that the statistics as given, based on mine production, are informative and useful to those engaged in the mineral industry of the Province. No change in the present general system of statistics is therefore contemplated.

By the co-operation so far effected it is expected that the mineral statistics of the Province, as reported by the two Bureaus, will not differ in any marked degree. The work of collecting, compiling, and presenting mineral statistics is somewhat complex, in which many arbitrary rulings or methods must be used.

The attention of prospectors and miners is drawn to the following definition of mineral contained in section 2 of the British Columbia "Mineral Act":—

> "'Mineral' means all valuable deposits of gold, silver, platinum, iridium, or any of the platinum group of metals, mercury, lead, copper, iron, tin, zinc, nickel, aluminium, antimony, arsenic, barium, bismuth, boron, bromine, cadmium, chromium, cobalt,

iodine, magnesium, manganese, molybdenum, phosphorus, plumbago, potassium, sodium, strontium, sulphur, tungsten, fluorine, vanadium, radium, uranium, lithium, thorium, titanium (or any combination of the aforementioned elements with themselves or with any other elements), asbestos, emery, mica, and mineral pigments; but limestone, marble, clay, or any building-stone shall not be considered as mineral within the meaning of this Act."

Limestone, marble, clay, and building-stone are acquired under the British Columbia "Land Act."

It should be noted that in 1925, for purposes of administration, the mineral tricalcium phosphate was taken out of the "Mineral Act." Under the "Phosphate-mining Act, 1925," deposits of tricalcium phosphate may be acquired by the location of phosphate claims one square mile in area.

### Geological Information.

By an arrangement made at the time the Province of British Columbia entered Confederation, all geological investigations and mapping in the Province were to be carried on by the Geological Survey of Canada; this agreement has been fully adhered to by the Dominion Government and has proved of great benefit to the mining industry of the Province. Each year a number of geological parties are kept in the field and in the aggregate a vast amount of information is available to the prospector and the mining engineer in the many excellent reports and maps covering British Columbia which have been issued by the Geological Survey of Canada.

For some years a branch office of the Geological Survey has been maintained in Vancouver, where copies of maps and reports on British Columbia can be obtained. The officer in charge of this office is Dr. Victor Dolmage and the address is 512 Winch Building, Vancouver, B.C.

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## ASSAY OFFICE.

### Report by D. E. Whittaker, Provincial Assayer.

During the year 1927 there were made by the staff in the Government Assay Office 4,114 assays or quantitative determinations and 282 analyses; of these the majority were for the Bureau of Mines or for the other departments, for which no fees were received.

The fees collected by the office were as follows:—

| | |
|---|---|
| Fees for analyses | $348.50 |
| Fees for assaying | 183.40 |
| Fees for assayers' examinations | 90.00 |
| Total cash receipts | $621.90 |

Determinations and examinations made for other Government departments for which no fees were collected:—

| | |
|---|---|
| Attorney-General's Department | $549.00 |
| Agricultural Department | 2,550.00 |
| Board of Health | 510.00 |
| Treasury Department | 13.50 |
| Forest Branch | 1,320.00 |
| Other departments | 200.00 |
| | $5,142.50 |
| Value of work done outside of Mines Department work | $5,764.40 |

The value of gold melted during the year 1927 was $715 in 9 lots, as compared with $9,710.60 in 23 lots in 1926.

### Free Determinations.

In addition to the above quantitative work, about 2,200 qualitative determinations, or tests, were made in connection with the identification and classification of rocks or minerals sent to the Bureau for a report; for these no fees were charged, as it is the established custom of the Bureau to examine and test qualitatively, without charge, samples of minerals sent in from any

part of the Province, and to give a report on the same. This has been done for the purpose of encouraging the search for new or rare minerals and ores, and to assist prospectors and others in the discovery of new mining districts, by enabling them to have determined, free of cost, the nature and probable value of any rock they may find. In making these free determinations, the Bureau asks that the locality from which the sample was obtained be given by the sender.

## EXAMINATIONS FOR ASSAYERS.

REPORT BY D. E. WHITTAKER, SECRETARY OF BOARD OF EXAMINERS.

I have the honour, as Secretary, to submit the Annual Report for the year 1927 of the Board of Examiners for Certificates of Competency and Licence to Practise Assaying in British Columbia, as established under the "Bureau of Mines Act," R.S.B.C. 1924.

A meeting of the Board of Examiners was held on May 20th and on December 16th, 1927. Two candidates applied for examination on May 20th, and one passed the examination on that date. The Board recommended that a certificate be issued to him. Two candidates applied for exemption under section 2, subsection (2), of the Act. The Board recommended that certificates be issued to these candidates.

In accordance with the recommendation of the Board, certificates have been duly issued by the Honourable the Minister of Mines to the three successful candidates.

LIST OF ASSAYERS HOLDING PROVINCIAL CERTIFICATES OF EFFICIENCY UNDER THE "BUREAU OF MINES ACT," R.S.B.C. 1924.

*(Only the holders of such certificates may practise assaying in British Columbia.)*

*Under section 2, subsection (1).*

| | |
|---|---|
| Adams, J. B. | Victoria. |
| Archer, E. G. | Anyox. |
| Armstrong, N. | Vancouver. |
| Ayres, D. A. | |
| Austin, John W. | Vancouver. |
| Backus, Geo. S. | Britannia Beach. |
| Baker, C. S. H. | |
| Bajus, N. J. | Vancouver. |
| Barke, A. C. | |
| Beilby, E. B. | Vancouver. |
| Bernard, Pierre | Monte Christo, Wash. |
| Bishop, Walter | |
| Boulding, J. D. | Vancouver. |
| Broughton, F. W. | Vancouver. |
| Buchanan, James | Trail. |
| Buehman, A. S. | Trail. |
| Campbell, Colin | New Denver. |
| Carmichael, Norman | New York. |
| Church, George B. | |
| Clarke, E. R. | Vancouver. |
| Cobeldick, W. M. | Scotland. |
| Collison, H. | Cobham, England. |
| Comrie, George H. | Vancouver. |
| Cotton, G. W. | Trail. |
| Craufurd, A. J. F. | Rossland. |
| Crerar, George | |
| Crompton, S. V. | Vancouver. |
| Cruickshank, G. | |
| Davidson, J. R. | Sacramento. |
| Day, Athelstan | Duncan. |
| Dedolph, Ed. | |
| Dockrill, Walter R. | Chemainus. |
| Dunn, G. W. | Rossland. |
| Farquhar, J. B. | Vancouver. |
| Fingland, John J. | Kaslo. |
| Gardner, C. S. | Victoria. |
| Grimwood, G.H. | Rosebery. |
| Grosvenor, F. E. | Vancouver. |
| Hamilton, Wm. J. | Anyox. |
| Hannay, W. H. | Trail. |
| Harsant, R. C. C. | |
| Hart, P. E. | |
| Hawkins, Francis | Lake Hill. |
| Hawes, F. B. | Vancouver. |
| Hodgson, A. R. | Anyox. |
| Hurter, C. S. | Prince Rupert. |
| Irwin, George E. | Vancouver. |
| John, D. | Haileybury, Ont. |
| Kiddie, Geo. R. | California. |
| King, R. | |
| Kitto, Geoffrey B. | Victoria. |
| Lang, T. F. | Vancouver. |
| Langley, A. G. | Revelstoke. |
| Laucks, I. F. | Seattle. |
| Lee, Fred E. | Trail. |
| Lee, Geo. M. | |
| Ley, Richard H. | Victoria. |
| Levy, Frank | |
| Lindsay, W. W. | Kimberley. |
| Locke, V. F. | Vancouver. |
| Longworth, F. J. | Boyds, Wash. |
| Manning, S. M. | Trail. |
| Martin, S. J. | |
| Marsh, Richard | Spokane, Wash. |
| Marshall, H. Jukes | Vancouver. |
| Marshall, William S. | Ladysmith. |
| Meale, Eric A. | East Helena, Mont. |
| Merrifield, T. T. | Trail. |
| Miles, Arthur D. | |
| Milne, A. S. | Vancouver. |
| Mitchell, Charles T. | Copper Cliff, Ont. |
| McCormick, Alan F. | Ruth, Nevada. |
| MacDonald, Alec C. | Vancouver. |
| MacDonald, J. S. | Vancouver. |
| McIntosh, J. H. | Bamberton. |
| McLellan, R. D. | Vancouver. |
| Morgan, Richard | Trail. |
| Nicholls, Frank | Norway. |
| Okell, S. E. | Vancouver. |
| Parker, Robt. H. | |

*Under section 2, subsection (1)*—Continued.

| | |
|---|---|
| Parsenow, W. L. | |
| Perkins, Walter G. | |
| Pickard, T. D. | Vancouver. |
| Pirrie, Noble W. | Victoria. |
| Poole, H. W. | Vancouver. |
| Prior, C. E. | Hedley. |
| Puder, H. F. H. | Vancouver. |
| Raht, K. | Trail. |
| Richmond, Leigh | Duncan. |
| Robertson, T. R. | Vancouver. |
| Rodgers, Ch. B. | |
| Rogers, G. J. | Knutsford. |
| Rombauer, A. B. | Butte, Mont. |
| Schroeder, Curt A. | |
| Segsworth, Walter | Toronto, Ont. |
| Shepherd, G. H. | North Vancouver. |
| Sharpe, Bert N. | |
| Sharples, H. | Vancouver. |
| Shore, J. T. | Vancouver. |
| Sim, Chas. John | Monte Carlo. |
| Sloan, Wm. | Vancouver. |
| Snyder, Blanchard M. | |
| Steven, Wm. Gordon | |
| Stimmel, B. A. | Trail. |
| Stockly, Galt | Princeton. |
| Sundberg, Gustave | Mexico City. |
| Tally, Robert E. | Spokane, Wash. |
| Taylor, E. S. | Vancouver. |
| Taylor, H. L. | Vancouver. |
| Teed, A. J. | Vancouver. |
| Thirkell, V. R. | Vancouver. |
| Thomas, Percival W. | Vancouver. |
| Tretheway, John H. | |
| Turner, H. A. | Vancouver. |
| Vance, John F. C. B. | Vancouver. |
| Van Agnew, Frank | Siberia. |
| Vaughan-Williams, V. L. | California. |
| Wales, Roland T. | |
| Watson, Wm. J. | Ladysmith. |
| Watson, Thomas | Vancouver. |
| Welsh, J. Cuthbert | Butte, Mont. |
| Wells, Ben T. | |
| West, Geo. G. | Vancouver. |
| Wenerstrom, L. H. | Anyox. |
| Whittaker, Delbert E. | Victoria. |
| Widdowson, E. Walter | Nelson. |
| Willemar, Douglas R. | Masset. |
| Williams, W. A. | Vancouver. |
| Williams, Eliot H. | |
| Williams, J. R. | Vancouver. |
| Wimberley, S. H. | Nevada, U.S.A. |
| Youngs, T. N. | Victoria. |

*Under section 2, subsection (2).*

| | |
|---|---|
| Archer, Allan | |
| Blaylock, Selwyn G. | Trail. |
| Bissett, D. G. | Trail. |
| Bolton, George E. | Silverton. |
| Brennan, Charles Victor | Britannia Beach. |
| Browne, R. J. | Rossland. |
| Browne, P. J. | Nelson. |
| Bryant, Cecil M. | Victoria. |
| Bryden, James | Trail. |
| Burwash, N. A. | |
| Cavers, Thomas W. | |
| Clothier, George A. | Nanaimo. |
| Cole, Arthur A. | Cobalt, Ont. |
| Cole, G. E. | Rossland. |
| Cole, L. Heber | Ottawa, Ont. |
| Collins, H. E. | Stewart. |
| Conway, E. J. | Vancouver. |
| Coo, Cecil William | Toronto, Ont. |
| Coulthard, R. W. | |
| Cowans, Frederick | |
| Dawson, V. E. | Trail. |
| Dempster, R. C. | Rossland. |
| Dempster, A. S. | Rossland. |
| Dixon, Howard A. | Toronto, Ont. |
| Eardley-Wilmot, V. L. | Ottawa. |
| Fotheringham, D. F. | Trail. |
| Galbraith, M. T. | |
| Gilman, Ellis P. | Vancouver. |
| Gray, Stanley | |
| Green, J. T. Raoul | Blairmore, Alta. |
| Guess, George A. | Toronto, Ont. |
| Harding, Wilson M. | |
| Heal, John H. | |
| Hearn, Roy D. | Trail. |
| Hilliary, G. M. | Idaho, U.S.A. |
| Howells, J. O. | Calgary, Alta. |
| Johnston, William Steele | Lachine, Que. |
| Kaye, Alexander | Vancouver. |
| Kendall, George | Vancouver. |
| Kidd, G. L. | Edmonton, Alta. |
| Kilbourne, Geo. H. | Victoria. |
| Lathe, Frank E. | Montreal. |
| Lay, Douglas | Hazelton. |
| Lewis, Francis B. | South Africa. |
| Mellish, Albert Henry | Premier. |
| Merrit, Charles P. | |
| Millen, J. | Trail. |
| Murphy, C. J. | St. Catharines, Ont. |
| Musgrave, W. N. | England. |
| McArthur, Reginald E. | |
| McBean, K. D. | Trail. |
| McDiarmid, S. S. | |
| McGinnis, Wm. C. | Queen Charlotte Ilds. |
| McKay, Robt. B. | Vancouver. |
| McLellan, John | Skidegate. |
| McMurtry, Gordon O. | |
| McNab, J. A. | Thompson, Nevada. |
| McPhee, W. B. | |
| McVicar, John | Edmonton, Alta. |
| Maclennan, F. W. | |
| Moran, P. J. | Vancouver. |
| Newton, W. E. | Sandon. |
| Norrie, James P. | Kirkland Lake, Ont. |
| Oliver, Chas. E. | Vancouver. |
| Oughtred, S. W. | Ainsworth. |
| Outhett, Christopher | Kamloops. |
| Pellew-Harvey, Wm. | London, England. |
| Pemberton, W. P. D. | Victoria. |
| Reid, J. A. | Cobalt, Ont. |
| Ritchie, A. B. | Nelson. |
| Roaf, J. R. | |
| Roscoe, Harold M. | Anyox. |
| Rose, J. H. | Thompson, Nevada. |
| Rutherford, R. C. | Trail. |
| Sampson, E. H. S. | Riondel. |
| Scott, John Mitchell | Stewart. |
| Scott, Oswald Norman | |
| Shannon, S. | |
| Sharpe, G. P. | Midland, Ont. |
| Shorey, P. M. | Trail. |
| Sloan, David | Three Forks. |
| Stevens, F. G. | Mexico. |
| Stewart, A. G. | Vancouver. |
| Stroud, J. E. C. | Anyox. |

*Under section 2, subsection (2)*—Continued.

Sullivan, Michael H.....Kellogg, Idaho.
Sutherland, T. Fraser.....
Sutherland, Wm.....Glasgow, Scotland.
Swinney, Leslie A. E.....
Thompson, W. K.....Trail.
Thomson, H. Nellis.....Anaconda, Mont.
Watson, A. A.....
Watson, Henry.....
Weir, William.....Anyox.
White, E. Grove.....Stewart.
Willis, F. S.....Trail.
Winslow, R. H.....Vancouver.
Wilson, Ridgeway R.....Victoria.
Workman, Ch. W.....
Wright, Richard.....Rossland.
Wynne, Llewellyn C.....
Yuill, H. H.....

*Under section 2, subsection (3).*

Carmichael, Herbert.....Victoria.
Galloway, J. D.....Victoria.
(Provincial Mineralogist.)
Harris, Henry.....Tasmania.
Hedley, Robt. R.....Vancouver.
Kiddie, Thos.....California.
Marshall, Dr. T. R.....London, England.
McKillop, Alexander.....Vancouver.
Robertson, Wm. Fleet.....Victoria.
(Provincial Mineralogist.)
(Retired Feb., 1925.)

PREVIOUSLY ISSUED UNDER THE "BUREAU OF MINES ACT, 1897," SECTION 12.

Thompson, James B.....Vancouver.

# REPORTS OF RESIDENT MINING ENGINEERS.

## "MINERAL SURVEY AND DEVELOPMENT ACT."

During the session of 1917 the Hon. the Minister of Mines brought in the "Mineral Survey and Development Act," which was passed on May 19th, 1917, and under the provisions of which the Province was divided into six Mineral Districts, to each of which there was appointed a Resident Mining Engineer with headquarters at a centrally located point in such district.

In the district to which he was appointed the Resident Engineer is expected to devote his whole time to the performance of the duties of his office, and to carry on continuously a mineral survey of his district, keeping records of the same and of the mining and mineral developments taking place, and at the same time to assist prospectors and others with such advice as may be necessary and may come within the scope of a mining engineer's work.

Aside from special reports which may be called for by the Minister, the Resident Mining Engineers are expected annually to make a comprehensive report covering all matters relating to mining, mine development, and prospecting that have occurred within the year in their respective districts.

These annual reports of the Resident Mining Engineers follow, and form the basis of the information given in respect to the mineral industry and its development within the Province.

The following are the six Mineral Districts into which the Province is divided, with the Mining Divisions included in each and the location of the permanent office of the district, with the name of the Resident Mining Engineer appointed to each district:—

The North-western Mineral Survey District (No. 1) shall consist of that portion of the Province contained within the following Mining Divisions, that is to say: Atlin, Stikine, Liard, Skeena, Nass River, Portland Canal, Bella Coola, and Queen Charlotte; and shall have its permanent survey station and office at the City of Prince Rupert. Resident Mining Engineer, H. T. James.

The North-eastern Mineral Survey District (No. 2) shall consist of that portion of the Province contained within the following Mining Divisions, that is to say: Omineca, Peace River, Cariboo, and Quesnel; and shall have its permanent survey station and office at Hazelton. Resident Mining Engineer, Douglas Lay.

The Central Mineral Survey District (No. 3) shall consist of that portion of the Province contained within the following Mining Divisions, that is to say: Clinton, Lillooet, Kamloops, Ashcroft, Nicola, Vernon, and Yale; and shall have its permanent survey station and office at the City of Kamloops. Resident Mining Engineer, H. G. Nichols.

The Southern Mineral Survey District (No. 4) shall consist of that portion of the Province contained within the following Mining Divisions, that is to say: Similkameen, Greenwood, Grand Forks, and Osoyoos; and shall have its permanent survey station and office at the City of Grand Forks. Resident Mining Engineer, Philip B. Freeland.

The Eastern Mineral Survey District (No. 5) shall consist of that portion of the Province contained within the following Mining Divisions, that is to say: Golden, Windermere, Fort Steele, Ainsworth, Slocan, Slocan City, Trout Lake, Nelson, Arrow Lake, Revelstoke, Lardeau, and Trail Creek; and shall have its permanent survey station and office at the City of Revelstoke. Resident Mining Engineer, A. G. Langley.

The Western Mineral Survey District (No. 6) shall consist of that portion of the Province contained within the following Mining Divisions, that is to say: Nanaimo, Alberni, Clayoquot, Quatsino, Victoria, Vancouver, and New Westminster; and shall have its permanent survey station and office at the City of Nanaimo. Resident Mining Engineer, Geo. A. Clothier.

The attention of those engaged in mining is drawn to the following sections of the "Mineral Survey and Development Act":—

### Provisions in Aid of Prospectors and Miners.

Sec. 10. Each Resident Engineer shall, so far as practicable, in and throughout his mineral survey district assist miners and prospectors in the manner following, that is to say:—

(*a.*) By giving information as to mineral indications and as to ground open for location as mineral claims or placer mines as a result of knowledge gained during the carrying-out of the mineral survey of his district:

(*b.*) By examining samples and applying such tests as may be possible on the ground or in his office and advising as to the nature of any mineral and as to the best available methods of analysis, sampling, assays, and test:

(*c.*) By forwarding samples to the Minister of Mines for further examination and tests whenever in his opinion such course is necessary or expedient:

(*d.*) By reporting to the Minister of Mines the location and approximate cost of such roads, trails, and bridges as in his opinion are reasonably necessary in order to render possible the development of any mineral resources; and

(*e.*) Generally, by giving such advice, information, and directions as may be of assistance to miners and prospectors within his district.

PROVISIONS FOR THE PROTECTION OF INVESTORS.

Sec. 16. Each Resident Engineer shall, upon receiving notice of any advertised or solicited sale of shares in any company or in any claim or mine or mineral property whatsoever, upon statements or terms not in accordance with actual facts and conditions, notify the Minister of Mines, who upon investigation may, if found necessary, give such notices, either personal or public, as may be necessary to prevent any injury to investors; and every notice given under this section by the Minister of Mines shall be absolutely privileged.

Sec. 17. (1.) Where a corporation, other than a private company under the "Companies Act," acquires an interest in, or title to, or engages in work on any mining property situate in a mineral survey district, it shall forthwith notify the Resident Engineer of that district, and file with him full particulars thereof, and shall also file with him, as soon as it is issued, a copy of every prospectus or statement in lieu of prospectus which is required by the "Companies Act" to be filed with the Registrar of Companies.

(2.) If a corporation makes default in complying with any requirement of this section, it shall be liable, on summary conviction, to a fine not exceeding twenty-five dollars for every day during which the default continues, and every director and every manager of the corporation who knowingly and wilfully authorizes or permits the default shall be liable to the like penalty.

# NORTH-WESTERN MINERAL SURVEY DISTRICT (No. 1).

By H. T. James, Resident Mining Engineer.

## INTRODUCTORY.

The North-western Mineral Survey District includes all the Pacific drainage area of the Province between the north end of Vancouver island and the Yukon, except the Skeena River valley beyond Terrace, and also all the Arctic drainage area in the Province north of the Peace river and its tributaries. In many parts of this territory of about 125,000 square miles there is more or less mining activity, except of course in the main part of the Liard basin, which is far removed from all modern transportation and attracts only an occasional prospector seeking placer gold.

The district is divided into several Mining Divisions, as follows: Queen Charlotte, Bella Coola, Skeena, Nass, Portland Canal, Stikine and Liard, and Atlin Mining Divisions.

The chief interest in the first five of these is in lode-mining, while placer-mining is of major importance in the remaining Divisions. Exceptions are to be noted in each of these groups of areas; as for example, there has been a small amount of placer-mining along the beach of Graham island, in the Queen Charlotte group, and in one or two streams near the head of Kitsumgallum lake, while lode-mining is becoming of increasing importance in the Atlin Division.

The activities and possibilities of the various Divisions are summarized briefly in the introductory remarks for each Division.

The literature on No. 1 District, in addition to the Annual Reports of the Minister of Mines, consists of a number of official reports, chiefly by the officers of the Geological Survey of Canada, and is listed below for reference.

List of Reports on No. 1 District.

| Author. | Title. | Publication. |
|---|---|---|
| | *Queen Charlotte Mining Division.* | |
| J. D. McKenzie | Geology of Graham Island | C.G.S.: Memoir 88. |
| | *Bella Coola Mining Division.* | |
| R. P. D. Graham | West Coast of British Columbia | C.G.S.: Summary Report, 1908. |
| V. Dolmage | Tatla-Bella Coola Area | C.G.S.: Summary Report, 1925, Part A. |
| V. Dolmage | Coast and Islands of B.C. between Burke and Douglas Channels | C.G.S.: Summary Report, 1921, Part A. |
| | *Skeena Mining Division.* | |
| R. W. Brock | Eutsuk Lake District | C.G.S.: Summary Report, 1920, Part A. |
| V. Dolmage | Coast and Islands of B.C. between Burke and Douglas Channels | C.G.S.: Summary Report, 1921, Part A. |
| V. Dolmage | Coast and Islands of B.C. between Douglas Channel and Alaska Boundary | C.G.S.: Summary Report, 1922, Part A. |
| Geo. Hanson | Reconnaissance between Kitsault and Skeena River | C.G.S.: Summary Report, 1923, Part A. |
| Geo. Hanson | Reconnaissance between Skeena River and Stewart | C.G.S.: Summary Report, 1923, Part A. |
| Geo. Hanson | Prince Rupert to Burns Lake | C.G.S.: Summary Report, 1924, Part A. |
| J. R. Marshall | Whitesail-Tahtsa Lake Area | C.G.S.: Summary Report, 1924, Part A. |
| | *Nass Mining Division.* | |
| J. M. Turnbull | Alice Arm District | Minister of Mines: Annual Report, 1916, page 53. |
| Geo. Hanson | Upper Kitsault Valley, Alice Arm | C.G.S.: Summary Report, 1921, Part A. |
| V. Dolmage | Coast and Islands of B.C. between Douglas Channel and Alaska | C.G.S.: Summary Report, 1922, Part A. |
| Geo. Hanson | Reconnaissance between Kitsault River and Skeena River | C.G.S.: Summary Report, 1922, Part A. |
| Geo. Hanson | Reconnaissance between Skeena River and Stewart | C.G.S.: Summary Report, 1923, Part A. |

LIST OF REPORTS ON NO. 1 DISTRICT—*Continued.*

| Author. | Title. | Publication. |
|---|---|---|
| | *Portland Canal Mining Division.* | |
| R. G. McConnell | Portland Canal District | C.G.S.: Memoir 32. |
| J. J. O'Neill | Salmon River District | C.G.S.: Summary Report, 1918, Part A. |
| S. J. Schofield and Geo. Hanson | Salmon River District | C.G.S.: Memoir 132. |
| V. Dolmage | Coast and Islands of B.C. between Douglas Channel and Alaska Boundary | C.G.S.: Summary Report, 1922, Part A. |
| Geo. Hanson | Reconnaissance between Skeena River and Stewart | C.G.S.: Summary Report, 1923, Part A. |
| W. D. Burton | Ore Deposits at Premier Mine | Econ. Geol., Vol. 21, page 586. |
| F. E. and C. W. Wright | (Reference to Unuk River Section) | U.S.G.S.: Bull. 347. |
| F. E. Wright | The Unuk River Mining Region | U.S.G.S.: Summary Report, 1905. |
| L. G. Westgate | Ore Deposits of Salmon River District (Alaska) | U.S.G.S.: Bull. 722, page 17, 1921. |
| | *Stikine and Liard Mining Divisions.* | |
| G. M. Dawson and R. G. McConnell | Explorations in Yukon and Northern B.C. | C.G.S.: Publication No. 629. |
| W. Fleet Robertson | Notes on Dease Lake and Groundhog Coalfields | Minister of Mines: Annual Report, 1912, page 65. |
| H. G. Nichols | Dease Creek | Can. Mining Journal, March 28, 1924. |
| W. A. Johnson | Gold Placers of Dease Lake Area | C.G.S.: Summary Report, 1925, Part A. |
| F. A. Kerr | Dease Lake Area | C.G.S.: Summary Report, 1925, Part A. |
| W. E. Cockfield | Explorations between Atlin and Telegraph Creek | C.G.S.: Summary Report, 1925, Part A. |
| | *Atlin Mining Division.* | |
| J. C. Gwillim | Atlin Mining District | C.G.S.: Annual Report, Vol. 12, 1899, Part B. |
| D. D. Cairnes | Atlin District | C.G.S.: Memoir 37. |
| W. E. Cockfield | Silver-lead Deposits in Atlin District | C.G.S.: Summary Report, 1925, Part A. |
| W. E. Cockfield | Explorations between Atlin and Telegraph Creek | C.G.S.: Summary Report, 1925, Part A. |
| ..... | (Reference to geology in vicinity of Rainy Hollow) | U.S.G.S.: Bull. 699. |

PRODUCTION.

The following table gives the production from shipping lode mines during the year 1927:—

| Name. | Ore. | Gold. | Silver. | Copper. | Lead. | Zinc. |
|---|---|---|---|---|---|---|
| | Tons. | Oz. | Oz. | Lb. | Lb. | Lb. |
| Atlin Mining Division— | | | | | | |
| Cherokee | 54 | 5 | 3,907 | ..... | 12,582 | ..... |
| Engineer | 4,189 | 2,025 | 1,400 | ..... | ..... | ..... |
| Portland Canal Mining Division— | | | | | | |
| B.C. Silver | 89 | 136 | 3,738 | ..... | ..... | ..... |
| Premier | 244,172 | 117,098 | 3,126,655 | 125,407 | 2,299,991 | ..... |
| Dunwell | 27,067 | 4,805 | 102,199 | ..... | 1,264,787 | 1,608,634 |
| Porter-Idaho | 125 | 134 | 61,706 | ..... | 95,948 | ..... |
| Terminus | 3 | ..... | 323 | ..... | 665 | 1,289 |
| Outsider | 13,695 | 55 | 3,912 | 424,653 | ..... | ..... |
| Silverado | 14 | 1 | 2,776 | ..... | 2,023 | ..... |
| Big Missouri | 5 | 13 | 626 | ..... | ..... | ..... |
| B.C. Bonanza | 1 | ..... | 309 | ..... | ..... | ..... |
| Nass River Mining Division— | | | | | | |
| Hidden Creek | 1,369,065 | 4,399 | 290,707 | 36,150,380 | ..... | ..... |
| Golskeish | 6,774 | 554 | 3,906 | ..... | ..... | ..... |
| Wolf | 28 | 4 | 2,051 | ..... | ..... | ..... |
| Esperanza | 7 | 2 | 720 | ..... | 105 | ..... |
| La Rose | 4 | 1 | 768 | ..... | 340 | ..... |
| Skeena Mining Division— | | | | | | |
| Trixie | 38 | 56 | 12 | ..... | ..... | ..... |
| Totals | 1,665,330 | 129,288 | 3,605,715 | 36,700,440 | 3,676,441 | 1,609,923 |

The placer-gold production from the district during 1927 amounted to $49,266, which is a decrease of $5,660 from the 1926 production. It is expected that the production from the Atlin camp, which is responsible for most of the placer output of the district, will be on the increase for the next two or three years.

### Roads and Trails.

As in past years, the Department of Mines has assisted very materially in 1927 in the development of the mining industry by constructing and assisting in the construction of many roads and trails. Some of these have been built to individual properties to facilitate their development or enable them to ship ore, while others have been built into districts which seem to be favourable prospecting areas. All active sections of the district have received their share of assistance. The number of grants made in each Division indicates, in a general way, the relative amount of new work being undertaken in the Divisions. Thus, the Portland Canal Division is being most actively developed and has received grants for no less than eleven individual pieces of road or trail work. The Skeena Division is second, with grants for six trails, and the Stikine Division has received grants for three trails. The Atlin camp is an old and established camp and is therefore fairly well provided with roads, but during the year the Spruce Creek road was extended to some upper workings and considerable money was spent on the road to the Atlin Silver-Lead Mines.

The Department of Mines has always assisted in this way in opening up any section of the country which the public wishes to prospect or to develop.

### Review by Mining Divisions.

The district will be reviewed under the main headings of the Mining Divisions, subdivided into sections as follows:—

Queen Charlotte Mining Division.
Bella Coola Mining Division.
Skeena Mining Division—Coast section; Canadian National Railway section; Kitsumgallum Lake section; Lakelse section.
Nass River Mining Division—Observatory Inlet section; Hastings Arm section; Alice Arm (Proper) section; Illiance River section; Kitsault River section.
Portland Canal Mining Division—Portland Canal (Proper) section; Georgia River section; Marmot River section; Bear River section; Salmon River section.
Stikine and Liard River Mining Divisions.
Atlin Mining Division—Rainy Hollow section; Atlin Lake section.

## QUEEN CHARLOTTE MINING DIVISION.

Practically nothing has been done in the Queen Charlotte Mining Division this year, aside from assessment-work on the few claims which are still in good standing in the district. About one-third of the mineral clams were allowed to lapse during the year; included in this was the *Big Swede* group near Lockeport, which has been a well-known property for several years. It was drilled at one time by the Granby Consolidated and has been examined by other large companies. This Division was not visited this year, but will be as early as possible in the spring of 1928.

## BELLA COOLA MINING DIVISION.

The Bella Coola Mining Division is the most southerly Division in No. 1 Mineral Survey District. It embraces an area of about 125 miles square on the Pacific slope of the Coast range, and is drained chiefly by the Bella Coola and Dean rivers, flowing into the heads of Burke and Dean channels respectively. That section of the district which borders on the coast-line has not been considered a very favourable place for prospecting, because most of it is underlain by rocks of the Coast Range batholith, or by large inclusions contained in it. While it is true that those rocks do not contain nearly as many mineral-showings as those along the eastern contact of the batholith, it must be remembered that some of the largest mines in the Province have been found on the west side of the batholith. The Coast section must therefore be regarded as a favourable one for prospecting. Up to the present time there have been more *mines* found on the western side of the Coast Range batholith in British Columbia and Alaska than there have been along the eastern contact, but there have been many more *prospects* located on the east than on the west.

The eastern contact of the batholith enters the Bella Coola Division at its extreme north-eastern corner, near the west end of Eutsuk lake, and follows an irregular south-easterly course to Kappan (or Charlotte) lake, at the head of Bella Coola river. The contact has been mapped* from Kappan lake to a short distance above Firvale on the Bella Coola river, but its exact position is not known between here and Eutsuk lake. The part of the contact which has been mapped follows along the north side of the Bella Coola river at a distance of 2 to 10 miles from it. Unfortunately, much of the area immediately along the contact is covered with glacial drift or Tertiary lavas and is not a favourable area for prospecting. Apparently the most favourable area in the whole Bella Coola valley is along the north side of the river between Burnt Bridge creek and Precipice camp, in a belt of greenstone from 4 to 8 miles wide, although it is quite probable that mineral-deposits will be found in other parts of the valley.

From information which is now available it would seem that the eastern contact of the batholith must cross Dean river, about 20 miles above its mouth. The section of the river-valley north of this should be favourable for prospecting.

There was very little activity in the Division this year and it was not examined.

## SKEENA MINING DIVISION.

The Skeena Mining Division is a rectangular strip of the British Columbia coast, extending from the entrance to Portland inlet, just north of Port Simpson, to Milbanke sound, including all the Coast islands, except the Queen Charlotte group, and the Mainland as far east as the crest of the Coast range. For the purpose of these reports it is divided into four sections: The Coast section; the Canadian National Railway section: Kitsumgallum Lake section, embracing the Kitsumgallum valley from the railway at Terrace to Lava lake in the divide between the Nass and the Skeena rivers: and finally the Lakelse Valley section, which takes in the extension of the Kitsumgallum Valley depression which lies on the south side of the railway.

Of the four sections of the Division, the Coast is the most active at present and possibly is the most important, but it cannot be said any of the sections are particularly active or imporant at the present time. There are no steadily producing mines in the Division, even on a small scale, since the mine of the Belmont-Surf Inlet Mines, Limited, become worked out a year or so ago, but two or three properties are coming along slowly and may eventually bring the district back into the producing ranks. Much money is being spent on railway, tram, and camp buildings on the old *Western Copper* property at the head of Khutze inlet, but the property is still but slightly developed or proven. The small amount of work which has been done within the last year on the *Trixie* group, Porcher island, and the *Black Wolf*, Kitsumgallum lake, has been fairly encouraging. Small shipments of gold ore have been made from both these properties during the year. It is possible that one of them may become a steady producer in a small way, although both are very much in the prospect stages of development.

### Coast Section.

**Western Copper.**

The *Western Copper* property consists of a large block of claims near the head of Khutze inlet. In 1926 they were purchased from Martin, Shannon & Mathers, of Vancouver, by the Revenue Mining Company. After doing some preliminary work the Revenue Mining Company turned the property over to C. G. Bush, of Detroit, who represents the Detroit Western Syndicate. It is now understood that this syndicate is forming a large corporation registered in the State of Delaware and ultimately will be registered within the Province. The Revenue Mining Company is a private company with a $500,000 capitalization, financed largely by Vancouver capital. Although it has sold the *Western Copper* property to the Detroit company, development-work is being administered by the Revenue Mining Company.

Since the property was examined last year by the Resident Mining Engineer very little work has been done on the showings of this property, and there is nothing to add to the description of the ore occurrence as found in the 1926 Annual Report. The company's efforts have been directed this year towards building a railway, tram, and a fairly large permanent camp, getting ready for more extensive underground development next season. During the summer a narrow-

* Dolmage, V.: Tatla-Bella Coola Area; Can. Geol. Survey, Summary Report, 1925, Part A.

gauge railway, just under 5 miles in length, was built from tide-water at the head of Khutze inlet to the main camp-site, just below the point selected for the working-tunnel. Twenty-pound steel was put on the ties, because a quantity of this material was on hand from an old railway which had been constructed for some 2½ miles up the same valley, but this steel will be replaced by heavier steel before much shipping is done. The grade is very good for a mining railway. The maximum grade up the valley is 2 per cent., and this is for a distance of but 1,000 feet, and the maximum reverse grade is 1 per cent. for a similar distance.

From this upper terminal a 3,000-foot aerial tram is being built to the tunnel-site. The right-of-way has been cleared and some of the towers erected, but the early snowfall prevented its completion this season.

The camp, which has been constructed at the upper terminal, consists of a bunk-house, 32 by 100 feet; a cook-house, 66 by 24 feet; a warehouse, 28 by 58 feet; and office buildings. All the rough lumber for ties and buildings was cut on the ground by the company under contract.

Throughout the greater part of the summer a crew of from fifty-five to sixty men was employed and the company is to be commended on the progress which has been made towards transportation and camp-construction.

**Rowe.** Three claims, the *Starboard Watch*, *Canadian Girl*, and *Rio Costello*, are situated on the west side of Pitt island, just below Captain cove, and are owned by C. O. Rowe, of Prince Rupert. The showings are situated at an elevation of about 1,400 feet above sea-level and are reached by a foot-trail which starts at a cabin on the beach and runs back for about 1½ miles over muskeg and soft soil chiefly.

The one vein on the property is typical of the gold-pyrite-quartz veins found at other points in the adjacent islands, being a very lenticular vein in the granodiorite of the Coast range and consisting of quartz and coarse-grained pyrite. The pyrite occurs in lenses and bunches rather than as disseminated grains, and gold, which is the only metal of economic importance, is intimately associated with it. Other sulphides are exceptionally rare.

The vein has followed a shear-zone in the granitic rocks and consists dominantly of quartz with lenses and bunches of pyrite, and in places it contains a large percentage of the sheared wall-rock in narrow strips, giving it a banded appearance. The strike is north and south (mag.), parallel to the hillside, and the dip appears to be very flat to the east into the hill, although at the bottom of the deepest cut the dip is appreciably steeper than at the very surface and it is possible that the vein dips at an angle of 30° or more.

The vein, which has been opened by a few surface cuts and by one short tunnel, varies in width from a few inches to 5 or 6 feet. The widest section is in the tunnel at the most northerly cut. A 5-foot sample across the face of this tunnel, showing very little pyrite, assayed very low in gold and silver. A sample of pyrite taken from a number of points along the vein gave returns of $4 in gold and 0.4 oz. silver to the ton. These samples would indicate that the gold in this property is associated with the pyrite, and therefore that the owners should prospect for lenses of pyrite and not work on sections of the vein which consist of quartz only.

**Trixie.** The *Trixie* group, also known as the Patterson property, is situated in Welcome harbour, on the north-west point of Porcher island, less than a mile from tide-water and at a few hundred feet elevation. The group is owned by Frank Patterson, of Refuge Bay, and is now bonded to J. B. Woodworth, who in turn claims to have interested a strong Eastern mining company in the property. In any event, it would seem that something is to be done to determine the possibilities of the property and such commercial ore as is discovered during the development will be shipped.

At intervals for several years past small shipments of sorted ore have been made to the smelter, either by the owner or by some operator working under lease and bond. In 1917 the property was bonded to the Belmont-Surf Inlet Mines, Limited, when considerable exploratory work was done without developing sufficient ore to warrant the bond being taken up. One of the tunnels driven at this time just missed a small bunch of high-grade ore, which was taken out later by the owner. All the ore which has been shipped has been mined from the surface from small stopes above the short prospect-tunnels. During 1927 38 tons of ore which had been rejected from previous shipments as low-grade material was sent to the Anyox smelter and yielded slightly more than $1,100 in gold, gross value. This would indicate that much of the material which is not massive sulphides might make a very good grade of milling-ore.

There are so many veins and workings that it is difficult to describe them satisfactorily without the aid of a plan, which I did not have time to make. In general, the showings consist of a number of steeply dipping veins in the quartz diorite of the Coast Range batholith. They are somewhat irregular in strike and dip, but have the same general trend, striking from N. 50° E. to N. 80° E. Each vein is quite lenticular, varying from a few inches to as much as 5 feet in width, and consists of quartz and pyrite. Although the latter is inclined to occur in small pods or bunches, constituting the high-grade ore-shoots, some of the veins carry a considerable amount of disseminated pyrite and might make a fair grade of milling-ore. The gold, which is the only metal of economic importance, seems to be associated with the pyrite only, for the clean quartz is barren, while the solid sulphides carry from $100 to more than $250 a ton in gold.

The irregularity of the veins themselves and the smallness of the individual high-grade ore-shoots make it extremely difficult to estimate the possibilities of the property, but there would seem to be a chance that a sufficient tonnage of milling-ore might be developed to make it attractive as a small property.

**I.X.L.**

The claims constituting the *I.X.L.* group, which is situated on Porcher island adjoining the *Trixie* group on the west, are the *I.X.L.*, *I.X.L. Fraction*, *Klim*, *Starlight*, and *H.E.D. Fraction*. They are owned by Dennisen & Wright, of Prince Rupert. The veins on this property have similar characteristics to those on the adjoining *Trixie* group, but, judging from what can be seen at the present time, the veins are smaller and therefore much less attractive from a mining standpoint. The strikes are in general about east and west (mag.) and the dips steep to the south. The one vein which has received the greatest amount of attention has been opened continuously for about 60 feet; a little less than half of this is an open-cut and the remainder a drift on the vein. Within this distance the vein pinches and swells from about 1 inch to 2 feet. Above the tunnel the vein can be traced another 100 feet or so up the hill, but wherever exposed it is only a few inches wide. A very short distance beyond the upper end of the vein and a short distance in the hanging-wall is another quartz vein 3 feet wide where first outcropping, but this also pinches rapidly to a narrow stringer.

Within the next 50 yards south are several other veins of similar characteristics, some of them heavily mineralized with pyrite and undoubtedly carrying good gold values.

The possibilities of the property rest on the ability of the owners to find either larger veins or sections in the known veins which are of minable width over a reasonable length. This can probably be done much more cheaply by surface prospecting than by underground development.

### Canadian National Railway Section.

**Iron Cap.**

This group of four claims—the *Iron Cap No. 1*, *Iron Cap No. 2*, *Teddy Bear*, and *Teddy Bear No. 3*—is situated on the north side of the Canadian National Railway, about a mile west of Amsbury, and is owned by Emile M. Smith, of Remo. Gale & Clifton, of Smithers, have taken a working-bond on the property and have one man employed for a part of the summer.

The one mineral-showing which has been found on the property, which was being prospected during the summer, occurs in the Jurassic greenstone,* very close to the main eastern contact of the Coast Range batholith. It consists of a small bunch of massive magnetite, chalcopyrite, and pyrite, apparently representing a replacement of the greenstones. At the time of the examination a tunnel had been faced up and most of the ore had been removed and piled in the open-cut. Only a small amount remained in place in the lower right corner of the tunnel. A short distance north-easterly from the bunch of ore is a narrow silicified zone striking towards the ore, but not reaching it.

Unless other outcroppings of ore can be found, having some continuity on the surface, the property cannot be regarded as one having attractive possibilities.

**Autumn.**

The *Autumn* group of claims, owned by Sam Alger, of Usk, is situated immediately north of the Canadian National Railway, about 2½ miles west of Amsbury Station. In the past a considerable amount of work has been done on zones of silicified and epidotized rock, which represent alterations of the surrounding greenstones and limestones. Unfortunately there is but very little sulphide mineralization shown in these zones. The work consists of three or four good-sized open-cuts and two rather lengthy

* *See* map, Geological Survey, Summary Report, 1923, Part A, page 33.

tunnels. Most of the work is confined to the altered greenstones, but a narrow band of crystalline limestone was cut in the most westerly tunnel and other narrow bands of limestone were observed outcropping on the surface a short distance north-east of the workings. There is said to be a similar zone of altered limestone and greenstone in the creek which flows across the property just east of the tunnels, but this could not be located.

Since the claims cover an area of greenstones, with interbedded bands of limestones, near the contact of the Coast Range batholith, there is a possibility that sulphide-deposits might be found within their limits, but it would seem that the work done on the present showings would indicate that they at least are not very promising. Rather than spend more time on the old workings it would be better to prospect the claims thoroughly for other silicified and epidotized zones and to search along such zones for places where sulphides are concentrated.

### Kitsumgallum Lake Section.

**Kalum Lake Mines, Ltd.**

The Kalum Lake Mines, Limited, was incorporated in 1924 with a share capital of 75,000 shares, having a par value of $1 each. The property which the company owns is known as the *Portland* group and is situated on the western shore of Kitsumgallum lake, near the south end. Nothing has been done on the property since it was last described by the Resident Engineer, 1925, but it is understood that explorations are to be resumed next year. In the past a considerable amount of drifting has been done from a shaft on a gold-quartz vein occurring in argillites alongside a granitic dyke. This shaft was full of water and could not be examined. A couple of hundred feet south of the shaft, in the granitic dyke, is a second quartz vein, striking south-west and dipping 60° S.E. A 20-inch sample taken across the vein, where it is exposed in an open-cut a short distance above the lake-shore, assayed 0.02 oz. gold and 0.6 oz. silver to the ton. The vein at this point consists of quartz with a very small amount of iron sulphides. Although the values are apparently negligible in the open-cut, it would be well to prospect the vein along the surface as far as possible on the chance of finding a higher concentration of gold, particularly if it is the intention of the management to re-establish the camp.

**Juneau.**

The property known as the Belway Estate is a part of the old *Treadwell No. 2* group, described in some detail in the Annual Reports for 1914 and 1918. It consists of the *Juneau* claim, situated on the east side of Kitsumgallum lake, about 2 miles from Rosswood, at the head of the lake. F. T. Monckton has an option on the property and has done some surface work during the past summer, but without discovering anything new of interest.

The mineralization occurs as narrow stringers in a slightly altered zone in sericitic schist. There is no well-defined lead, but within a certain zone the schist is cut by narrow stringers of quartz, epidote, and bornite, and the whole is stained to a certain extent with green copper carbonate. Native gold has been found in this zone,* but none of it was observed at the time of the examination. As far as could be determined, the only workings which are on this particular showing are an open-cut right on the main trail and a shaft a few feet from the trail on the lake-shore. Just back from the trail a tunnel was driven into a bluff, but it would be above the ore-zone, which is apparently quite flat and strikes in an east-westerly direction. A winze sunk in the floor of the tunnel had been filled in.

The shaft below the trail is right on the edge of the lake and was nearly full of water at the time of my visit. A 1-foot sample, representing all the ore which could be seen in the shaft above the water, assayed 0.5 per cent. copper, 0.10 oz. gold, and 0.1 oz. silver to the ton. Higher values have been obtained and reported in the 1914 Annual Report.

**Black Bear.**

This group is situated on the north side of Maroon mountain, near the head of Hall creek and a few miles east of the head of Kitsumgallum lake. Last year the claims were held under bond by D. W. Davis and associates, but it is reported that they have reverted to the original owners; this report, however, has not been verified.

The outcrop of the vein and open-cuts could not be examined, for the property was visited during a heavy snow-storm, after 6 or 8 inches of snow had already fallen. The underground

* Minister of Mines' Report, 1914, page 107, under *Treadwell* group.

work consisted of a 140-foot crosscut tunnel and about 65 feet of drifting along a vein which is said to have been traced for several hundred feet on the surface. The vein is a quartz vein in argillites, mineralized with variable amounts of pyrrhotite, sphalerite, galena, and chalcopyrite, and also carrying values in gold, which is the most important mineral. It strikes about N. 20° E. (mag.), dips at 60° to the west, and varies in width from a few inches to a reported width of 4 feet. The width of the vein in the face of the north drift (about 40 feet long) is 14 inches and the width in the face of the south drift is about 4 inches. At intervening points along the drifts the widths are seldom wider than 18 inches.

A sample taken across the vein in the face of the north drift assayed: Gold, 0.80 oz. to the ton; silver, 1.2 oz. to the ton; lead, 0.4 per cent.; zinc, 5 per cent. It had been stated by prospectors in the district that the argillites on either side of the vein carried good values in gold, but two samples which I took from the wall-rock adjoining the vein only returned traces of gold and silver. One sample was taken for a width of 15 inches on either side of the vein in the face of the north drift, and the other was taken in a similar manner from the face of a drift on this same vein on the adjoining property, the *Black Wolf*.

If the gold values should hold up in wider sections of the vein, this might make a nice little property.

**Black Wolf Mining Co.**

The Black Wolf Mining Company was organized in the State of Washington in 1923 with a capitalization of $100,000, divided into 100,000 shares having a par value of $1 each. The company has acquired the *Black Wolf* group of five claims—*Black Wolf Nos. 1* to *5*, inclusive—situated on Maroon mountain at an elevation of from 4,500 to 5,500 feet above sea-level and about 4½ miles due east of the north end of Kitsumgallum lake. It adjoins the *Black Bear* group and development-work is being done on the same vein on both properties.

Although there are at least three veins on the *Black Wolf* property, all the work this year has been done on the same vein which has been opened on the *Black Bear*. One of the other veins, outcropping alongside the creek which drains the small lakes near the camp, has not been broken into at all, and another vein, on which work has been done in the past, is narrow, flat, and unattractive, even although gold can be panned from its outcrop in most places. The third vein, the one on which the tunnel has been driven this year, has the same strike and dip as the *Black Bear* vein; it is considered to be the same vein, but a covering of fresh snow made it impossible to trace the vein from one property to the other. The first two veins mentioned are in argillites; the last, at the point where the tunnel has been driven, is in a 50-foot bed of conglomerate, below which almost all the gold-quartz veins in this district have been found.*

The veins occurring below the conglomerate are generally flat and small and consequently of little importance. It is therefore rather interesting and significant to find a vein in the district which is both steeply dipping and cutting through the conglomerate.

The tunnel, driven on the vein, was started up under the bluffs south-easterly from the camp and advanced for about 30 feet. The ore taken from this drift has been sacked and shipped to the smelter.

A 1-foot sample across the vein in the face of the tunnel assayed: Gold, 1.06 oz. to the ton; silver, 2 oz. to the ton; lead, 1 per cent.; zinc, 5 per cent. These values are remarkably similar to the values obtained from the *Black Bear* sample, but unfortunately in both instances the vein is rather narrow. The values, however, are distinctly encouraging and if similar values can be found in slightly wider sections of the vein the property will become attractive.

*Mother Lode.*—The owners of the *Mother Lode* group have extended their crosscut another 22 feet, but have not yet reached their objective. This group is situated on Maroon mountain, between the South fork of Hall creek and Maroon creek.

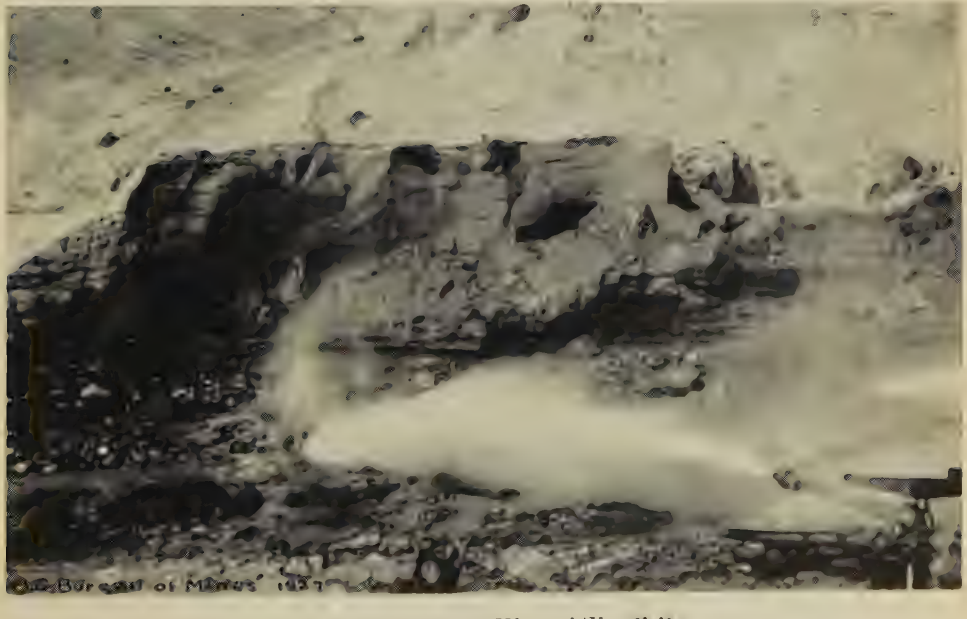
**Marmot.**

This group is situated on the north side of Goat mountain, due east of Rosswood, at the head of Kitsumgallum lake. Another year's assessment-work has been done on it this year. The drift was continued another 10 or 15 feet in low-grade material. A specimen handed to me as being representative of the type of material being found assayed: Gold, trace; silver, 0.8 oz. to the ton; lead, 0.6 per cent.

*Hunter.*—This group is situated in the Kitsumgallum valley, about 18 miles north of the head of the lake. Last winter a 24-foot vertical shaft was sunk down through the foot-wall of the vein.

* G. Hanson: Geological Survey, Summary Report, 1923, Part A, page 42.

Alice Arm Town and McGrath Mountain (right).



Adams Hydraulic Mine, Atlin M.D.

Premier Gold Mining Co., Ltd.

Marmot Creek, Portland Canal M.D.

*Placer-mining.*

The only placer-mining which is being carried on in the Kitsumgallum Valley section this year is in Douglas creek, a small creek flowing westerly into the head of Kitsumgallum lake through a very deeply incised and steep-walled valley. This is one of four creeks which flow from Goat mountain, which have been the scene of small and relatively unimportant placer-mining operations for the last half-century. Douglas and Hall creeks flow westerly into Kitsumgallum lake and the two other creeks, Lorne and Fiddler, flow easterly into the Skeena river. It has been suggested that the placer gold in these creeks comes from a number of small bedded veins in the argillites from 50 to 100 feet below a massive bed of conglomerate which outcrops near the head of each of these creeks.*

Since 1922 D. R. Shaw and his sister, Mrs. C. Stewart, have been holding and working leases on Douglas creek, and immediately above them two other leases are being worked by Stevens & Cavenaugh. The four have been working together, ground-sluicing during the summer, getting ready for more productive work when the water goes down. In September Mr. Shaw sent out 6½ oz. gold, running $17.10 to the oz. Some of the gold is quite coarse, single nuggets weighing up to ½ oz. All the gold is not of the same fineness, for at least two distinctively different-coloured nuggets were observed.

LAKELSE SECTION.

Although some work has been done on certain claims in the Lakelse section, time could not be found to visit this part of the district.

## NASS RIVER MINING DIVISION.

The Nass River Mining Division is a relatively small but important Division, embracing all of Portland inlet, with its various arms, and the lower part of the Nass River valley. The upper part of the Nass River valley is more accessible from the head of Portland canal than from any other point on the Coast and is therefore included in the Portland Canal Division. Recognized mining sections in the Nass River Division are five in number—the Observatory Inlet, Hastings Arm, Alice Arm (proper), Kitsault River, and Illiance River sections.

The Observatory Inlet section is really the most important in the entire North-western Mineral Survey District from the standpoint of the present mineral production, for within its boundaries is situated the *Hidden Creek* mine of the Granby Consolidated Mining, Smelting, and Power Company, one of the largest copper-mines of the Province.

Besides treating its own ore at the Anyox smelter, the company takes a certain amount of custom ore and in this way is a distinct asset to the small producers in the northern sections of the Coast, particularly to those who have copper or gold ores to ship. The company is working also the *Golskeish* mine in the same section and the *Outsider* mine in the adjoining Portland Canal section. In the *Bonanza* property, near the *Hidden Creek* mine, the Granby Company has done sufficient underground work and diamond-drilling to block out nearly half a million tons of good copper ore,† but as yet no steps have been taken to mine this ore-body. It is a replacement in greenstones below the argillites.

The Hastings Arm section is that part of the Division which is tributary to Hastings arm, a long narrow arm of Portland inlet, which parallels Portland canal and penetrates the Coast range to within about 5 miles of the eastern contact of the Coast Range batholith. After this eastern-contact area has been made more accessible by better trunk trails it may become an important mining section. As it now stands it is a very attractive section for prospecting, for it lies between the Portland Canal and Alice Arm sections, both of which are known to contain important mineral-deposits. It is only about 15 miles in a direct line from the head of the Marmot river, flowing into Portland canal, to the head of the Kitsault, flowing into Alice arm. On the Marmot are situated such properties as the *Porter-Idaho* and *Prosperity*, two very promising prospects. The well-known and very profitable *Premier* mine is up the Salmon river, which flows into Portland canal opposite the Marmot river.

In the upper part of the Kitsault River section there are a number of prospects with very good showings, such as the *Dolly Varden*, *Toric*, *Tiger*, *Wolf*, *Vanguard*, *Lucky Strike*, and

* G. Hanson: Geological Survey, Summary Report, 1923, Part A, page 42.

† V. Dolmage: Geological Survey, Summary Report, 1922, Part A, page 20.

others. With good showings at both ends of a 15-mile strip of the eastern contact of the Coast Range batholith, the middle section should be a favourable one for prospecting. It is a section which should receive the attention of those interested in the development of the mining industry of the Province.

At present the only prospect which is being developed in this section is the *Saddle* property at the head of Hastings arm. It is situated in a roof-pendant some miles from the eastern contact. This roof-pendant is presumably continuous with a belt of similar rocks which occurs on Portland canal around the mouth of the Georgia river. Since the *Saddle* property is at one end of the belt of greenstones which make up the roof-pendant and there are a number of claims at the other end in the Georgia River section, it would seem that this belt would also constitute a favourable one for prospecting.

The whole Alice Arm mining community—that is, the Alice Arm section proper and the Kitsault and Illiance River sections—has not received a great deal of attention since the *Dolly Varden* ceased shipping in 1921. One reason for this is that most of the prospects are up the Kitsault river from 15 to 20 miles from tide-water and are dependent upon the *Dolly Varden* railway as a means of transportation. Although the *Dolly Varden* mine is closed, the railway is still there and is being kept in such repairs by the Government that light traffic is being handled over it with gasoline-speeders, so that the preliminary development in the valley can be conducted quite easily.

Some of the properties in the upper Kitsault valley should receive attention from examining engineers. The *Wolf* property, a part of the *Dolly Varden* holdings, should be some inducement to investigate the *Dolly Varden* property as a whole. The *Wolf* is situated on the opposite side of the river to the *Dolly Varden* and 2 miles farther up the valley. It is stated that diamond-drilling has demonstrated the existence of a considerable amount of milling-ore. In addition to these two properties, the *North Star*, *Toric*, and *Tiger* are properties which are partially developed and in which at least fair silver values are found. There are several other silver properties which might bear investigation. While it is not certain that all or any of these properties will stand up to systematic and accurate sampling, still there are a sufficient number of silver prospects within the upper Kitsault valley to justify a careful investigation of them by some large organization. Since all the properties are prospective milling properties and the transportation will be quite a problem, it is suggested that the district could be developed to the best advantage by one or two large companies, each operating more than one of the smaller properties.

Some special mention should be made of a part of the Illiance River section. I refer to the McGrath Mountain portion lying between the North-east fork of the Kitsault and the Illiance rivers. It is only about 4,000 feet high, reaching just to timber-line, and is situated at the very head of Alice arm, separated from the tide-water by about a mile of gravel flats.

The mountain is underlain, for the most part, by argillites. There are a few bands of limestone and conglomerates interbedded in these and a little andesitic material, observed in a few places, may represent interbedded volcanic rocks, either flows or breccias. A large basaltic dyke several hundred feet wide crosses the mountain in a north-south direction, cutting the argillites and related rocks. There are also a number of small basic dykes and a few outcrops of felsitic rock. It is possible that the basic dykes occupy the fissures through which the Tertiary lavas came to the surface. The lavas can be seen on the plateau-like strip of country south of the Illiance.

A great number of claims have been staked on McGrath mountain and on every claim there is some showing of zinc ore. The surprising part of it is that in almost every instance zinc is practically the only metal present. There is usually a small amount of lead, as galena, but in only a few places is galena at all conspicuous. The same may be said of pyrite. Gold and silver values are very low. On the *Silver Chord* property high silver values have been found in narrow stringers, but in general the mineralization is essentially zinc-blende. The zinc occurs as an amber-coloured sphalerite and is associated with quartz, calcite, and a little barite. Most of the showings are in argillites, but they also occur in light-coloured dense felsitic rocks in the andesitic material and in the conglomerates. No showings were noticed in the limestones, but it is quite probable that such occur.

The same type of mineralization is found extending north-west of McGrath mountain to the Devlin zinc property and across the North-east fork of the Kitsault. It is apparent that a strip

of country a few miles long by a mile or two wide, underlain chiefly by argillites, has a distinctive type of mineral-deposit, characterized by the presence of an amber-coloured sphalerite, and very little of any other sulphide or valuable metallic constituent. The term* "silver-belt" has been applied to that zone containing a number of silver properties extending from the *David Copperfield* to the *Last Chance*, a distance of about 4 miles; and the term "copper-belt" referring to a similar belt of copper prospects paralleling the silver-belt on the west. Similarly, there is a defined belt of small high-grade silver (lead-zinc) properties in the argillites west of the lower Kitsault. It would seem that the term "zinc-belt" might be applied very aptly to this zone of zinc prospects which crosses McGrath mountain.

Since McGrath mountain does have a great number of zinc-ore showings of a uniform type, I think this mountain should be investigated as a unit by any company seeking zinc prospects. Many of the showings do not amount to much, but a few seem to have distinct possibilities.

### Observatory Inlet Section.

**Granby C.M.S. & P. Co., Ltd.**

The annual production from the company's *Hidden Creek* mine on Granby bay is still on the increase, being nearly 160,000 tons greater than last year. A total of 1,370,407 tons were mined, of which 1,054,986 were milled, producing 84,068 tons of concentrates. The smelter handled 315,421 tons of *Hidden Creek* ore and 53,397 tons of concentrates, the remainder of the concentrates having been shipped to Tacoma. The amount of material smelted is not much more than half what it was last year, because a much greater proportion of the ore is being milled and sintered before going to the smelter. In June of this year one of the two furnaces was shut down.

The Granby mill was originally built to handle 1,000 tons of ore a day, but within the past year additional machinery has been added on the same floor-space, increasing the capacity to 3,200 tons a day. This is 200 to 400 tons better than the estimated capacity.

The production from the *Hidden Creek* mine in 1927 was 36,150,380 lb. copper, 4,399 oz. gold, and 290,707 oz. silver.

The production from the company's *Outsider* mine, situated in Maple bay, Portland canal, was only 13,695 tons, as compared to 34,729 tons produced last year. The tonnage from the *Golskeish* mine, which is also operated by the Granby Company, was increased slightly from 6,212 to 6,774 tons.

The 1927 output from the coke plant was as follows:—

| | |
|---|---|
| Coke (short tons) | 35,900 |
| Gas (thousand cubic feet) | 293,038 |
| Tar (imperial gallons) | 288,584 |
| Ammonia (pounds) | 254,128 |
| Motor-fuel (imperial gallons) | 10,761 |
| Solvent naphtha (imperial gallons) | 3,033 |
| Naphthalene (pounds) | 36,200 |

The personnel of the staff remains much the same and is as follows: Chas. Bocking, general manager; W. R. Lindsay, general superintendent; G. M. Lee, smelter superintendent; John Swanson, mine superintendent; A. E. Todd, coke-plant superintendent, succeeding Mr. Leslie; W. B. Maxwell, concentrator superintendent; and A. S. Baillie, chief accountant, succeeding Mr. Bagwell.

**Homestake.**

This group of three claims—the *Homestake*, *Starlight*, and *Sunrise*—is situated in Granby bay, westerly from the Granby smelter and adjoining the Granby Company's property. The property is owned by Mr. McRostie, of Anyox. Although very little rock-work has been done on the property, the owner has done a very great deal of surface-stripping and ground-sluicing in an endeavour to locate the source of a number of large boulders of ore which he discovered in a small creek flowing across the claims. Many of these boulders are massive sulphides up to 2 feet in diameter, and although some of them are well rounded, others are subangular and do not appear to have travelled far. After having seen the ore in the *Hidden Creek* mine, a mile or so north, one has but little hesitancy in believing that the *Hidden Creek* ore-bodies are the source of the boulders. They could not have come from Mr. McRostie's claims very well, for the gangue is greenstone and not the meta-

* J. M. Turnbull: "Alice Arm District," Annual Report, Minister of Mines, B.C., 1916.

morphosed argillites and tuffs which underlie his claims. I am not sufficiently familiar with the occurrence of the *Bonanza* property, adjoining McRostie's claims and owned by the Granby Company, to know whether or not there is a possibility of the *Bonanza* ore-zone extending into McRostie's claims under the argillites. If the claims do intercept the strike of the *Bonanza* ore-body they would become a favourable area for electrical prospecting. The *Bonanza* ore-body occurs in greenstone below the argillites which outcrop on McRostie's claims.

**Hanna Property.**

Fourteen un-Crown-granted claims situated immediately north of and adjoining the holdings of the *Hidden Creek* property of the Granby Company have been held for a number of years by William Hanna, of Anyox. Two main showings are found on the property. One of these, on the west side of Hidden creek, is a silicified and slightly mineralized shear-zone in greenstones. It strikes about N. 10° W. (mag.) and dips westerly into the hill at an undetermined angle. There was so much snow on the ground that I examined only a few small cuts at the south end of the zone, but these were said to be representative of the whole zone. It is 30 feet or more in width and, besides being silicified, it is slightly mineralized in places with small amounts of pyrrhotite, pyrite, and chalcopyrite. At no point did I see sufficient of the latter to make it worth while sampling.

The second showing is a quartz vein paralleling the shear-zone and about 2,000 feet east of it. This vein is from 6 to 18 feet wide and consists of quartz with small amounts of pyrite, chalcopyrite, sphalerite, and galena.

The possibilities of this ground and the country in general north of the *Hidden Creek* property does not depend so much on the occurrence of these two showings, but on the possibility that blind ore-bodies, similar to those in the *Hidden Creek* mine, might be found there. The *Hidden Creek* ore-bodies are related so definitely to such a pronounced structure, which appears to be an overturned fold, that one is very curious to discover whether or not the fold (if such it be) does not plunge northerly, and therefore carry with it an extremely favourable zone for prospecting. The area north of the *Hidden Creek* ore-bodies is underlain by the argillites, below which these ore-bodies are found. The geology of this whole area has been studied by J. A. Bancroft for the Granby Company and the structure mapped undoubtedly, but for my own satisfaction I would like to spend a day or two north of the *Hidden Creek* mine. Unless it has been proven definitely that the structure with which the *Hidden Creek* ore-bodies are associated does not continue to the north under the sediments, the ground north of the known ore-bodies must be regarded as favourable prospecting-ground.

### Hastings Arm Section.

**Saddle.**

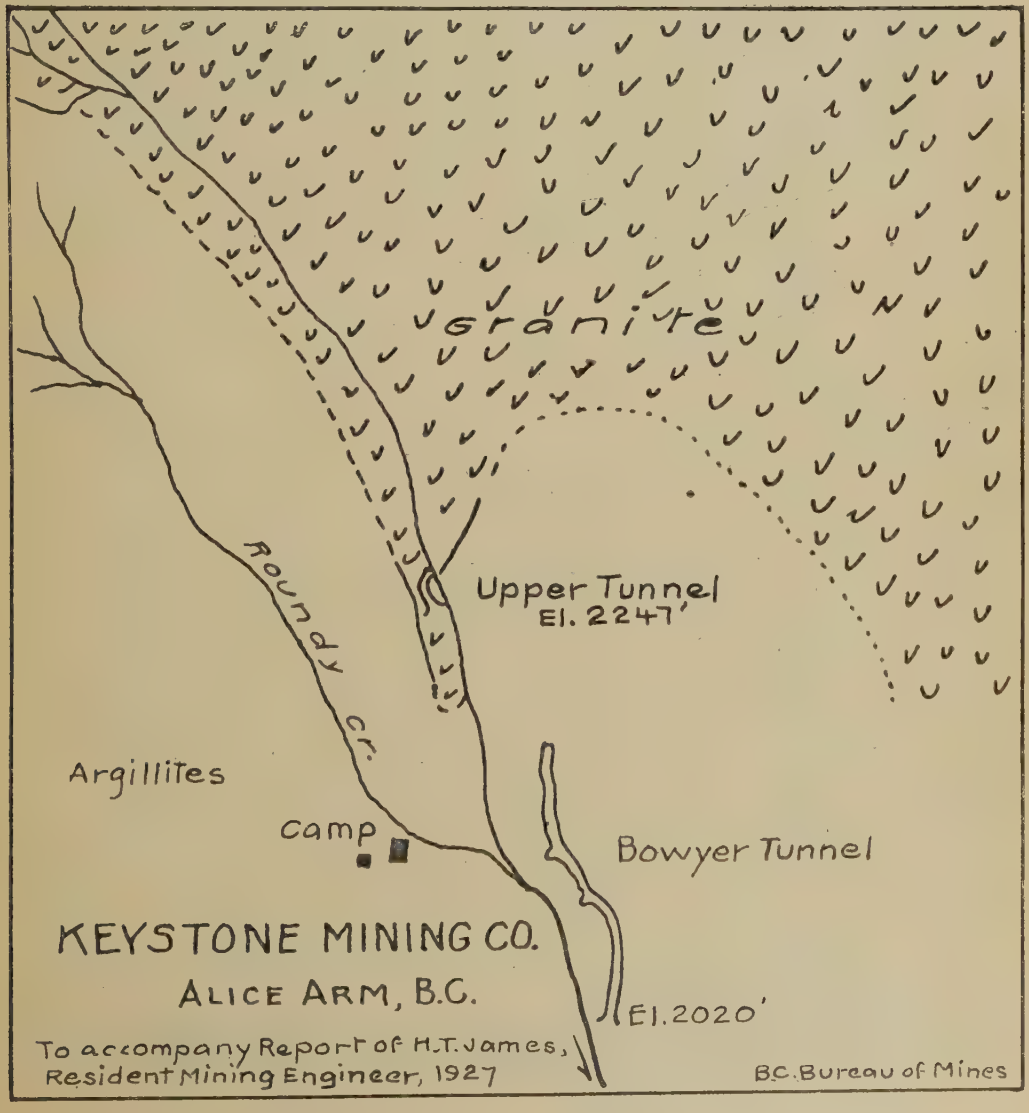
The *Saddle* group of claims, situated at the head of Hastings arm at an elevation of 4,000 feet, is being developed by the Silver Crest Mines, Limited, under the supervision of P. E. Peterson, of Vancouver. The Silver Crest Mines, Limited, is a company incorporated in 1919 with a capitalization of $500,000, divided into 2,000,000 shares of the par value of 25 cents each. In addition to the *Saddle* property, this company owns and has been developing the *Silver Hill* group, in the Portland Canal district, referred to in this and other reports under the heading "Silver Crest Mines, Limited."

The showings which are being developed on the *Saddle* occur in a series of andesitic volcanic rocks outcropping along the west side of Hastings arm for a distance of about half a mile from the head of the arm. These rocks are a part of a fairly large roof-pendant within the Coast Range batholith and are probably continuous with a band of similar rocks which are found in the Georgia River section of the Portland Canal Division. The mineral-deposits of the *Saddle* property are found within a few hundred feet of the northern limit of the greenstones. They consist of a main quartz vein with several narrow branch veins and a fairly pronounced shear-zone which has not been prospected as yet. The main vein has been traced for a distance of about 300 feet. It varies in width up to 4 feet and consists of quartz, with coarse-grained galena and pyrite, carrying fair silver and gold values where the sulphides are most plentiful. The main vein and each of its narrow branch veins occur along fault-planes, which have displaced a granitic dyke from a few inches to several feet. The strike of the narrowest vein is about north-south (mag.), while that of the main veins is more north-westerly. Crossing the main vein and cutting it off completely is an indication of a shear-zone, striking north-easterly. Most of this is covered with drift and has not been prospected as yet, although it is realized that some work should be done on this zone to determine whether or not it is mineralized.

Development-work consists of a number of open-cuts, three shafts, and drifts from the bottom of two of the shafts. No. 1 shaft was started on June 25th of this year when the ground was covered with 2 to 12 feet of snow, and after the snow had melted it was found that it had been sunk on an offshoot from the main vein. It was sunk to a depth of 46 feet, and from the bottom a drift was driven to the north for 12 feet. The vein in these workings varies from 2 to 4 feet. For the first 18 feet down the shaft there is a lens of massive lead, zinc, and iron sulphides from 12 to 18 inches wide along the hanging-wall side of the vein. From 18 to 34 feet the vein is very poorly mineralized, but below this sulphides are reappearing, indicating the possibility of another sulphide lens below.

No. 2 shaft is a prospect-shaft 8 feet deep on the same vein as No. 1 shaft and about 125 feet south of it. No. 3 shaft is located on the principal outcrop of ore near the extreme north end of the vein. It is 38 feet deep and from the bottom the vein was drifted on for 17 feet to the north. The vein is well defined, dipping 65° to the west, and varies from 4 to 5 feet wide. The solid lead and zinc sulphides on the hanging-wall side varies from 2 to 3 feet in width.

Samples indicate that the massive sulphides will carry a small amount of gold, from 5 to 25 oz. silver to the ton, up to 40 per cent. lead, and 17 per cent. zinc. For the details of the season's work I am indebted to P. E. Peterson, consulting engineer for the company.



### Alice Arm (Proper) Section.

**Keystone Mining Co., Ltd.**

The Keystone Mining Company, Limited, was incorporated in 1923 with a capitalization of $200,000, divided into 200,000 shares, the registered office being in the Birks Building, Vancouver. The company's holdings consist of the *Sunset* group of seven claims situated on Roundy creek, on the south side of Portland canal, a short distance below Silver City and about 1½ miles from tide-water. The group is owned by the estate of the late W. G. Morley, of Alice Arm, and partners, and is being worked under option by the Keystone Company.

The principal showings occur in a tongue of granitic rock (*see* plan) a very short distance east of the main easterly contact of the Coast Range batholith. On the surface immediately above the upper tunnel (elevation 2,247 feet) are two veins about 10 feet apart, one on either side of the granite. They are mineralized with quartz, calcite, and small amounts of galena, sphalerite, and pyrite. About 200 feet in elevation above the camp and in the tongue of granite is a 12-foot quartz-calcite vein, sparsely mineralized with pyrite and carrying low values in silver and gold. The upper tunnel referred to, at elevation 2,247 feet, has been driven for a short distance along one of the veins outcropping above it and has exposed a mineralized lens up to 14 inches wide.

While the chief objective of the prospecting programme is the vein in the tongue of granitic rock, the veins themselves are not confined to this rock, but extend into the surrounding argilites, apparently as a single vein, and have been traced down a small creek for some distance. The Bowyer tunnel, at elevation 2,024 feet, has been driven along the vein in the argillites towards the upper tunnel and the tongue of granite to see what the veins are like at this depth. At the time of my visit, August 3rd, the tunnel had not reached its objective, but I understand that it was driven as far as the upper tunnel before the camp was closed for the winter. The present plans of the company are to do some crosscutting from the face of the tunnel next season.

The Bowyer tunnel followed the vein most of the way in and, although it encountered a few lenses of ore, it developed nothing of commercial importance.

**Theda Bara.**

This group of two claims—*Theda Bara* and *Bebe Daniels*—is owned by Jones & Ingraham, of Alice Arm, and is situated at an elevation of from 3,200 to 3,500 feet above sea-level, between Lime and Roundy creeks, immediately south of the Keystone Company's property. Two veins occur on the property. The one which has received the greatest attention occupies a fault and shear-zone in the argillites and has been traced for some little distance along its strike by open-cuts and tunnels. The upper tunnel, at about 3,200 feet elevation, is 51 feet long and, although it does not show much mineralization in the face, is said to have had 4 feet of ore a short distance back. There is a pile of massive sulphides (pyrite, pyrrhotite, sphalerite, and galena) on the dump which undoubtedly came from this tunnel. About 20 feet in elevation below the upper tunnel is a second tunnel driven on the vein for 20 feet. Some massive sulphides were also found in the vein at this point, but in general it is not a very encouraging vein. I believe this tunnel and lower open-cuts are on the *Sunset No. 1*, belonging to the Keystone Mining Company.

The second vein is just over the break of the hill, above the tunnels and to the right, about 20 feet from the granite-contact. It is about 5 feet wide and consists of massive pyrrhotite with some quartz. The vein is of no commercial value, carrying only small amounts of gold and silver, and without visible signs of any of the common metallic minerals except pyrrhotite. A sample assayed by the Colorado Assaying Company, of Denver, Colorado, returned 0.25 per cent. nickel, but apparently did not contain any other common metal, except iron.

Although the vein apparently has no commercial value, it is interesting because native sulphur is formed as a result of the surface alteration of pyrrhotite.

### Illiance River Section.

**Wolf.**

The *Wolf* property consists of one Crown-granted claim, owned by John Stark, of Alice Arm, and bonded to Jack Fiva and associates, of the same town. It is situated on the north side of the *Dolly Varden* railway-track, within a few minutes' walk from the Alice Arm Post-office.

Last year a crosscut was driven to the vein from the surface and about 100 feet of drifting was done along the vein. This year a raise has been driven in the vein a distance of 70 feet to the surface and two small stopes have been started. The raise and one stope are on the

main vein, which is a narrow-bedded vein in sand argillites, dipping about 20° into the hill; the other stope is on a branch vein, having the same strike, but a steeper dip than the main vein and branching from it at the point where the main vein was intersected by the crosscut. The veins are quartz, well mineralized in places with pyrite, galena, sphalerite, tetrahedrite, ruby silver, and native silver. The ruby silver seems to occur both as a primary and as a secondary mineral, but the native silver is presumably secondary only, occurring along joint-planes and in the broken sections of the vein. The best ore occurs on the walls as narrow lenses of massive sulphides an inch or two thick at those points where the argillites have been sheared to a graphitic gouge or fine-broken schist. Some sulphides are scattered through the quartz gangue, but the valuable ore-shoots are those consisting of massive sulphides, even although these are usually much narrower than the quartzose parts of the vein.

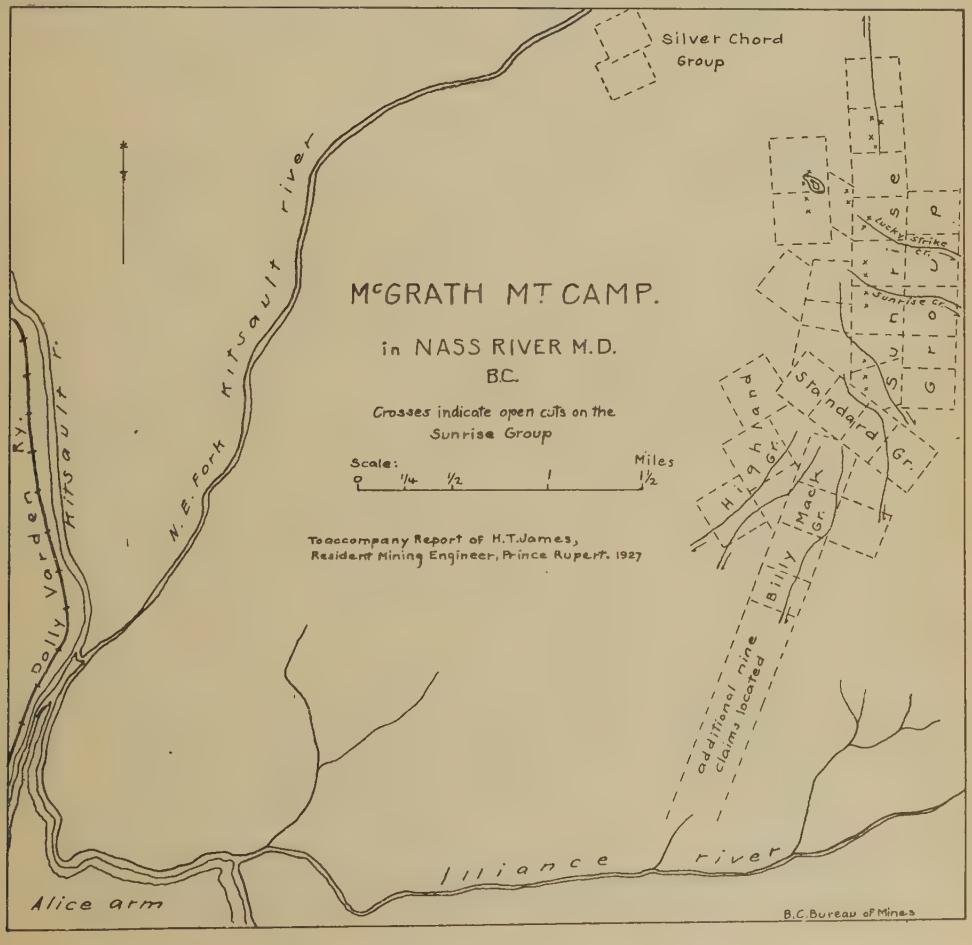
Later than the mineralization and the intrusion of narrow basic dykes, which cut the veins, there has been some movement in the plane of the main vein and a deposition of calcite along the openings thus produced.

About 28 tons of ore was shipped in 1927, producing over 2,000 oz. silver and nearly 3.5 oz. gold.

**Sunrise.**

A score of claims may be included in this one description under the name *Sunrise*, for these claims can be acquired as one property if desired. They are owned by various men in the district, for whom M. S. Benischke, of Alice Arm, is acting as agent. The claims referred to and described below are all those north of the four *Standard* claims, shown on the accompanying sketch-map of McGrath mountain.

The claims are situated on the crown of McGrath mountain at about 4,000 feet elevation and within 4 or 5 miles of tide-water at the head of Alice arm. At present there is a good



horse-trail from Alice Arm to the camp on the *Standard* group, but from there on up the trail is exceptionally steep and would need to be altered if any quantity of supplies were to be taken in.

The most important vein on the property is known as the "Banded" vein. Along its strike of about N. 30° W. (mag.) showings of zinc ore are exposed in a number of cuts and for a very considerable length. I had time to examine only those on the *Sunrise* and *Silver Sand* claims, where the indicated length of the vein or vein-zone is at least 1,200 feet. A cut on this vein in Sunrise creek exposed a zone from 12 to 15 feet wide, mineralized with several lenses of massive sphalerite and variable amounts of quartz. A 10 foot sample across the cut on the north side of the creek assayed: Gold, trace; silver, 0.4 oz. to the ton; lead, *nil;* zinc, 8.8 per cent. While this is the widest section of the vein, it is also the poorest as far as grade is concerned. Some 300 feet south of this the vein is about 4 feet wide, and 800 or 900 feet north the vein is apparently several feet wide, but sufficient work had not been done to determine its actual width and attitude. At both of these cuts the vein contains an appreciably higher percentage of zinc than the one I sampled.

From the wide showing in Sunrise creek another vein has been traced for about 300 feet down the creek in an east-south-easterly direction. The south end of the vein is narrow, 2 to 4 feet, but strong and exceptionally well mineralized with sphalerite, while the north end, in a faulted block, is wider and, although not so high grade, is a good milling-ore.

The third vein on the property, known as the "Keely" vein, is about parallel to the "Banded" vein and 800 or 900 feet west of it. It is from 1 to 4 feet wide and where examined contains a fair proportion of zinc. In addition to the three veins described there are one or two other promising veins which have not been prospected.

All the veins occur in argillites and in many instances are closely associated with narrow basic dykes. One very large dyke of olivine basalt, about 600 feet wide, parallels the Keely and the Banded vein and is about 600 feet west of the former vein. The veins themselves consist dominantly of fragments of argillites cemented with quartz and sphalerite, with but very small amounts of pyrite and an odd grain of galena. The ore is esentially a zinc ore, for there is no gold, practically no silver, and very little lead.

There are so many showings on these claims and they are so well situated for economical mining that I think they have considerable prospective merit and are well worth investigating.

**Standard.** The *Standard* group of four claims—*Standard* and *Standard Nos. 1, 2,* and *3*—owned by Miles Donald, of Alice Arm, and partners, is situated on McGrath mountain, south of and adjoining the *Sunrise* group described above. (*See* map.) Time did not permit a sufficiently lengthy examination of the property to enable me to form an independent opinion of its merits, but it is mentioned here because it is one of the properties on McGrath mountain where at least fair showings of good zinc ore are to be found. From descriptions in other Annual Reports it is evident that the ore on this property is a clean zinc ore, containing very little or no gold, silver, or lead and very little iron sulphide; it could therefore be treated to advantage with other ores on the mountain, if such should be developed.

If any one should examine the properties on McGrath mountain the *Standard* should be among those examined.

**Highland.** The *Highland* group of six claims—*Anyox, Anyox No. 1, Swan, Highland, Highland No. 1,* and *Highland No. 2*—is situated on McGrath mountain immediately south-west of the *Standard* group and is owned by Jones & Ingraham, of Alice Arm. The showings are between 1,500 and 2,000 feet above sea-level and are about 5 miles by the present horse-trail from Alice Arm, or a little more than half that distance from the town by direct line.

The claims are underlain by a thick series of black graphic argillites, interbedded conglomerates, and a small amount of andesitic and felsitic rock, whose nature and relation to the sediments has not been determined. Like the other properties on McGrath mountain, there are numbers of showings on the property, but owing to their number and insufficiency of development there has not been enough work done to determine the length of any one ore-zone. However, the owners have done a great deal of work and are to be commended. It takes quite a bit of digging around to pick out the zone which will probably show up the most ore for the season's work.

Two or three of the exposures are in Jones creek, the most westerly creek on the claims and just west of the cabin. The lowest cut on the west side of the creek is in slightly sheared

argillites and has exposed a number of feet of mineralized ground. A 10-foot sample across the cut, but not across the full width of the zone, assayed: Gold, trace; silver, 0.4 oz. to the ton; lead, trace; zinc, 2.5 per cent. Since my examination I have been informed by one of the owners that this cut has been extended into the hill and has found appreciably better material. Lead sulphide is plentiful in the specimen shown me from this place and, on assaying, it was found to contain some silver values. The mineralized zone strikes about N. 20° W. and appears to dip westerly at 55° to 60°. In the stream-bed above this cut small amounts of lead and zinc sulphides occur in places in the argillites along the strike of the vein.

On the east side of the creek, about 50 feet up-stream from the ladder which provides access to the stream-bed, is an open-cut in conglomerate. For 10 or 15 feet above the cut, up to the brink of the canyon, the conglomerate has weathered out into a fairly loose mass of boulders, each boulder consisting of a number of the pebbles of the conglomerate. The boulders are probably the result of the combined action of shearing and surface weathering. What sphalerite there may have been around the boulders has been leached out, leaving behind only a small amount of iron oxide, but on cracking the boulders many of them show mineralization with variable amounts of sphalerite, calcite, and barite. The mineralized zone is several feet wide and well worth prospecting, but so much loose material would have to be removed in getting down to the solid that it is disheartening for a single prospector to tackle. The attitude of this mineralized zone could not be determined very readily. It appears to strike about parallel to the first vein mentioned, but to dip in the opposite direction.

In the small creek east of the cabin are still other showings. Down-stream from the cabin is a sparsely mineralized zone in an andesitic rock. Farther up-stream, above the cabin, is a mineralized zone in the argillites which looks fairly promising. I understand that a cut has been put across this since my visit and has uncovered 5 to 6 feet of zinc ore. A specimen from the cut contained considerable pyrite as well as sphalerite. Still farther up is another mineralized zone in a very light-coloured, dense rock, which appears to be a highly metamorphosed feldspar porphyry. A specimen (not a sample) selected to check up on the silver values assayed: Gold, trace; silver, 0.6 oz. to the ton; lead, *nil;* zinc, 8.6 per cent. This is apparently the same type of mineralization as on other parts of McGrath mountain, for there is no gold and very little silver or lead. Both these last two showings strike about parallel to the creek-channel.

It would be well to pick out one or two of the best-looking zones and determine their length and continuity by a series of trenches not too far apart.

**Billy Mac.** The *Billy Mac* is a group of five or six claims situated south of the *Standard* group and east of the *Highland* group, McGrath mountain. Just below a tent camp on the trail and on either side of a creek two fairly wide and strong veins in argillites have been prospected with open-cuts and a tunnel. The veins strike about north-south (mag.) and dip rather steeply to the west. They consist of slate fragments cemented in quartz, through which there is a sprinkling of sphalerite. The sulphide mineralization is not very strong in any of the cuts, but I believe something better would be found in the cut nearest the trail if it were deepened, for it is not below the zone of surface leaching and contains quite a bit of iron oxide. Since the veins on McGrath mountain usually contain but one sulphide, sphalerite, which leaches out very easily, leaving a very fine, light-brown, spongy deposit of iron oxide in its place, there is always a good chance that zinc ore will be found beneath rusty leached outcrops on the mountain.

**Kitsault-Eagle Silver Mines, Ltd.** This company was incorporated in April, 1926, with a capitalization of $500,000, divided into 500,000 shares, with its registered office in the Standard Bank Building, Vancouver. W. G. McMorris, of Vancouver, is the managing director. The company is developing three properties in the Alice Arm camp—the *Silver Chord*, *LeRoy*, and *Eagle*. The *Silver Chord* group, consisting of four claims—the *Silver Chord*, *Silver Chord No. 2*, *Big Gash*, and *Big Gash No. 2*—is situated on the east side of the North-east fork of the Kitsault river, about 6½ miles from the town of Alice Arm. It is really on the north end of McGrath mountain (*see* plan) and the ore occurrence is very similar to other deposits on this mountain.

The one vein which has been found on the property is a vein in the argillites, consisting of fragments of country-rock cemented by quartz, and contains variable amounts of sphalerite, with smaller amounts of pyrite and galena. Some narrow streaks run high in silver, suggesting that some of the silver minerals may be present locally. The vein follows a narrow dyke

containing much biotite (kersantite or minette) and occurs on either or both sides of the dyke; it is said to have been traced for about two claim-lengths. Its strike varies from north-west to north-south (mag.) and the dip is very steep to the west.

In addition to open-cuts, which I did not see, two tunnels have been driven along the vein and a small amount of crosscutting has been done. By the end of September No. 1 tunnel had been advanced to a total length of 232 feet and short crosscuts had been driven at 80 feet and 137 feet from the portal. The first 60 feet of the tunnel developed shoots of zinc ore from 2 to 4 feet wide. One hundred feet lower in elevation, at 1,290 feet above sea-level, a second tunnel is being driven which was in 36 feet at the time of my visit. The vein in this tunnel is strong enough, but not very well mineralized.

The development of this property is being executed with some vigour. The lower tunnel is being continued during the winter and diamond-drilling is planned for the spring.

The *LeRoy* property consists of fourteen claims, situated on Red Top mountain, about 12 miles from Alice Arm, up the North-east fork of the Kitsault river.

From the cabin at about 2,400 feet elevation, for about 600 feet up Red Top mountain, the rocks exposed are very fine-grained cherty-appearing rocks, having in places a suggestion of a bedded structure. At elevations from about 3,000 to 3,700 feet is a granodiorite dyke and then to 4,500 feet and apparently to the top of the mountain is a series of very highly metamorphosed sediments. These break up on weathering into small sharp-cornered cubes and the exposed surfaces become stained by iron oxide to deep-red tones. Within this zone of intense metamorphism are numerous small flat quartz veins and veinlets, mineralized with variable amounts of molybdenite, pyrite, pyrrhotite, and, more rarely, chalcopyrite. Most of them are of no importance whatever. One vein, rather larger than the rest, outcrops at about the same elevation as the cabin and a few hundred feet north of it. It is mineralized with pyrite, sphalerite, galena, and tetrahedrite. Work done at this point is said to have demonstrated that the vein stands at a fairly steep angle, but the part which was exposed in the old cuts at the time of my visit is certainly flat.

There are so many small veins and so much general mineralization on Red Top mountain that one might hope to find a commercial vein on it somewhere.

The *Eagle Group*, the third property being developed by the Ktsault-Eagle Silver Mines, Limited, consists of six claims—the *Eagle Nos. 1, 2, 3,* and *4, Eagle Fraction,* and *Eagle No. 1 Fraction*—and is situated in the Kitsault River valley, about 1½ miles north of the *Dolly Varden* railway and about 8½ miles from Alice Arm.

A tunnel is being driven to tap a vein which has been traced a couple of claim-lengths on the surface, but it had not reached its objective. The surface values in the vein are distinctly low.

I.X.L. This is a group of five claims—*I.X.L. Nos. 3, 4, 5, 6,* and 7—situated on the north side of the North-east fork of the Kitsault river, some 7 or 8 miles from Alice Arm. They are owned by A. McGuire, of Alice Arm. In a creek which flows by the cabin at about 1,300 feet elevation is a quartz vein striking south-east (mag.) and dipping easterly at about 50°. The cut on the vein at this point is filled with gravel, so that very little of the vein could be seen, but there are some large pieces of zinc ore on the dump. It would be advisable to determine the length of the sulphide mineralization by tracing the vein with surface trenches if the overburden is not too deep.

Another quartz vein in a creek a couple of hundred feet west is not very encouraging. The country-rock is argillite in both instances.

### Kitsault River Section.

Wildcat. The *Wildcat* group is situated on the south side of Homestake creek, a mile below Camp 8, on the *Dolly Varden* railway, and about 20 minutes' walk from the railway. The property is owned by A. Davidson and partners, of Alice Arm. A short distance southerly from the cabin a tunnel has been driven in greenstones about 250 feet due south (mag.), presumably to explore for a vein outcropping higher up the hill. About 325 feet in elevation above this tunnel a second tunnel 225 feet long has been driven about S. 10° E., and from a point more than half-way to the face a working has been driven to the left a short distance. Another 25 feet higher and a little to the left is a third tunnel and

an open-cut on a vein. The tunnel, which is short, started in the ore, but soon went through it into the foot-wall.

The vein, exposed in the open-cut near the upper tunnel, is a shear-zone in the greenstones, mineralized with streaks of quartz and chalcopyrite, and would probably assay fairly well in copper across widths of 3 to 6 feet. Its attitude is rather difficult to determine, but it strikes, in general, about parallel to that part of the hillside which is immediately above the two upper tunnels and dips northerly with the hill, but I am not sure whether or not it is steeper or flatter than the hillside. The outcrop is around a shoulder a short distance to the left of the tunnels.

The upper tunnel has evidently gone through the vein into the foot-wall; and the next lower tunnel may be in the foot-wall entirely—at least, a considerable part of it is below the vein.

The prospectors in this case would be much farther ahead if they left the underground work alone and followed the vein on the surface. It would be well worth their while to uncover the vein continuously for 150 feet or so, down and across the hill, from the open-cuts near the upper tunnel, for the vein lies about parallel to the hillside and its line of outcrop will be found to take an unexpected direction, as it is followed around the shoulder just to the left of the tunnels.

There may be other showings on the property, but as there was no one around at the time of my visit some of the workings may not have been found.

**Toric Mines Co., Ltd. (N.P.L.).**

This company was known formerly as the Consolidated Homestake Mining and Development Company, Limited, and was incorporated with a capitalization of $500,000, divided into 100,000 shares. During 1927 its name has been changed to the Toric Mines Company, Limited, and the capitalization has been increased to $625,000. It is developing the *Toric* property, consisting of four claims—*Toric*, *Anglo*, *Moose*, and *Lamb*—situated about a mile beyond the upper end of the *Dolly Varden* railway, on the opposite side of the river.

The *Toric* ore-bodies have been described at length in previous reports* and it is unnecessary to repeat these descriptions. I did not have time to do more than spend a few hours underground and pay a very hasty visit to the lower group of surface showings.

For a general description of the underground workings it is sufficient to say that crosscuts and drifts have opened up the ore-body for about 280 feet along its strike—nearly east-west (ast.). These workings show that the ore-body, on this one and only level, has an apparent width of 100 feet, or an apparent thickness, allowing for the dip, of some 70 feet. After having seen the surface showings of this same vein or ore-body the width indicated is rather surprising and immediately suggests that some abnormal condition exists on this level. The following is Geo. A. Clothier's description of the surface showings as published in the 1925 Annual Report:—

"On the lower or main vein the first cut is at the foot of the hill, about 150 feet above the trail, here showing a width of about 20 feet. Five feet on the foot-wall is mineralized, banded quartz, jasper, and barite; then 8 feet of country-rock; then 4 to 7 feet on the hanging-wall, of similar ore to the foot-wall. . . . Three or four open-cuts up the hill from this, in a distance of about 500 feet along the outcrops, show about a foot of ore in a 4-foot vein, carrying high values in ruby and native silver and argentite."

With these conditions known to exist on the surface, it is obvious that the ore-body cannot continue through to the surface with a thickness of 70 feet, and, further, it cannot be assumed that it carries its thickness of 70 feet down for any great distance below the level. This point is made in order to emphasize the fact that owing to a peculiar set of circumstances it is impossible to assume that any substantial quantity of ore has been blocked out in the *Toric* mine. This statement will hold true until the size and grade of the ore-body has been determined on more than one level. Indications of possible tonnages might be arrived at by diamond-drilling the ore-zone above and below the level or by crosscutting higher up the hillside.

The reason for the unexpected thickness of the ore-zone on the level is not altogether apparent, although one possible reason suggested itself while studying the faulting in the mine. It seems evident that movement along a fault-plane, crossing No. 2 drift west and cutting the

* *See* especially B.C. Minister of Mines' Annual Reports for 1918, page 60; 1925, page 76; 1926, page 84; and Canadian Geological Survey Summary Report, 1921, Part A, page 15.

hanging-wall at an angle, has been such as to increase the width of the ore-body in No. 1 crosscut materially. How much faulting has taken place is not apparent, but it is an example of one condition which has apparently been responsible for the unexpected width of the ore on this level. The ore-body may have been naturally wide on this level, but how far it will hold this width above or below the level remains to be proven.

While the *Toric* is a good prospect, further development is required to definitely prove up tonnage.

During the summer a power plant was installed and the 50-ton mill, as originally planned, was completed. Trial runs of the mill demonstrated conclusively that it was not suited to the ore and that an addition of flotation units would be necessary. This will be done next season. The original mill contained: Jaw-crusher, one set of rolls, Hardinge ball-mill with amalgamation discharge, classifier, and two tables.

**Tiger.**

The *Tiger* group of three claims—*Tiger*, *Lion*, and *Del Norte*—owned by Ed. Pickett, is situated on the east side of the Kitsault river, immediately north of the *Toric* and about a mile beyond the upper end of the *Dolly Varden* railway. The showing on the property consists of a number of faulted sections of a single quartz vein, averaging about 8 feet wide and carrying values in silver. Although the vein is broken by a number of faults, each of the faults and the faulted sections of the vein have been located in a section of the hillside about 300 feet wide, where the overburden is not too great, and are exposed in a number of surface cuts and trenches. Each end of the vein is covered by talus and the underground work has not been extended beyond the limits of the ore-zone as exposed on the surface. Four fault-blocks have been found so far. One of them has a known length of 240 feet, but the others are much shorter, varying from 10 to 60 feet in length. The vein stands at a fairly uniform and steep angle, but the strike changes appreciably from block to block and even within the same block. Strikes from N. 05° to N. 40° W. were noted.

The vein is a massive quartz vein, rather sparsely mineralized with pyrite, galena, sphalerite, ruby silver, argentite, native silver, and probably other silver minerals. Some of the ruby silver is undoubtedly primary, occurring in the quartz in the same manner as any other primary mineral, but some is also found as a coating on joint-cracks near watercourses and would seem to be secondary. All the native silver observed is secondary, for it occurs either as thin plates on joint-cracks, associated with argentite, or as wire silver in leached parts of the vein. The silver which is found as plates on joint-cracks near water-channels must have been carried in from above by surface water for a short distance at least, and the vein at such a point has been enriched by the process of secondary enrichment. Much of the native silver noted did not occur as thin plates of silver on joint-cracks, but as wire silver in solution cavities, and it is evident that this native silver is a residual product, left in the space formerly occupied by the primary ruby silver when the sulphur and antimony were carried away in solution by surface waters. In this case the silver is secondary, but the ore has not been "enriched" with silver, because the silver was there originally. The only enrichment there has been is due to the slight loss in weight occasioned by the removal of the sulphur and antimony. Since the *percentage* of these materials in the ore is slight, the amount of silver enrichment due to their removal is negligible. It is important to make this distinction between secondary silver, which represents an enrichment of silver, and that which does not represent any such enrichment, for an ore in which the values are due chiefly to "enrichment silver" will not go down below the zone of oxidation, whereas an ore in which the values near the surface are due to "non-enrichment silver" will go down into the primary ore without much change in grade and will carry its values to the bottom of the original ore-shoot. Since both types of silver are found in this deposit, it is to be expected that the grade of the ore will diminish somewhat as the primary ore is reached, but parts of the vein at least carry good values in primary silver. Without making a very careful study of the ore it is impossible to estimate the percentage of silver values which are due to secondary enrichment. At 102 feet below the surface small but nice bunches of ore have been opened carrying a good percentage of primary ruby silver, and on the same level plates of native silver and argentite occur along joint-planes near the foot-wall of the vein.

Since last year two short crosscuts have been driven into two of the faulted sections of the vein and have encountered some fair-looking silver ore. The property is a nice prospect and seems to have a fair chance of developing into a small milling property.

**Red Point.**

The *Red Point* group is situated on the west side of the Kitsault river, north of Evindsen creek, about 1½ miles from the end of the *Dolly Varden* railway. This year a considerable amount of underground work was done by C. Spencer and associates, of Vancouver, who had an option on the property. The work demonstrated to the satisfaction of the engineer in charge, Mr. Heidman, that the mineralized zone is too low grade to be commercial.

At the time of my visit, August 7th, a 420-foot crosscut had been driven under a big red point which outcrops about 300 feet above the portal and is mineralized with copper and iron sulphides. The tunnel, except for a few feet near the portal, is in barren greenstones. Just near the portal a silicified zone carrying some chalcopyrite was crossed, but a drift to the right soon ran into barren ground.

**Copper Cliff.**

The *Copper Cliff* group of four claims, owned by A. Davidson and partners, of Alice Arm, is situated on the west side of the Kitsault river, about 3 miles beyond the end of the *Dolly Varden* railway. C. Spencer and associates held an option on the property, but relinquished it at the end of the summer. A tunnel was driven into a big red iron-stained zone which outcrops on either side of a small creek. The bluff is a fairly siliceous fine-grained porphyry, mineralized with disseminated pyrite and an occasional small bunch of chalcopyrite. The tunnel was in 150 feet at the time of my visit, but had not found any ore. The property was drilled a number of years ago by the Granby Consolidated Company.

**Vanguard.**

The *Vanguard* group of four claims, owned by Morris Peterson and partners, of Alice Arm, is situated on the west side of the Kitsault river, about 5 miles beyond the end of the *Dolly Varden* railway. This is another one of the four properties which was being developed by the Spencer interests and which was dropped with the others at the end of the summer. On the surface nice showings of copper ore are exposed in two or three cuts, close together, but I do not know how far commercial ore has been traced. The owners drove a tunnel below the best showings a few years ago, and, although they did not find ore in the crosscut, a drift to the right did run into some fairly nice copper mineralization. This year a tunnel was started about 200 feet below the outcrop, but it had not reached the vein at the time of my visit in August. The vein was cut shortly afterwards, however, and a considerable amount of drifting has been done along the vein. The results, apparently, were disappointing, for nothing more is to be done on it by this syndicate.

It is said that a small amount of crosscutting done by the owners after the option was given up was successful in finding ore. I have not seen any of the new work on the vein.

**Homestake.**

The *Homestake* was the fourth property optioned by the Spencer interests in the Kitsault valley and abandoned. It is situated on the east side of the Kitsault river, about 8 miles beyond the end of the *Dolly Varden* railway. The showings consist of one or two wide silicified zones, or ledges, in a volcanic breccia. The ledges consist of silicified country-rock and vein quartz in variable proportions, which in places are more than 30 feet wide. The strike is about N. 70° W. (mag.) and dip is apparently to the north, but at an undeterminable angle. One of the veins is mineralized at the south-east end with veinlets and disseminations of pyrite, galena, and sphalerite, and at the north-west end some cuts in a less silicified rock show considerable chalcopyrite. Three tunnels were driven towards the vein a few years ago, but only one of them reached it. The tunnels were not examined this year.

C. Spencer dropped the property without doing any work on it at all. It is evident from the appearance of the outcrop that the ore would be low grade, and without sampling the veins carefully it is difficult to say whether or not it is too low grade to be commercial. The sulphide content, however, is very small, except in a few isolated cuts.

**Vanguard Extension.**

This is a prospect south of the *Vanguard*, owned by Morris Peterson, one of the owners of the *Vanguard*. Although there is but little shown in the way of mineralization, the property has some prospective merit, since it lies in a belt known to contain a number of large outcrops of mineralized ground carrying some values in copper. Some of these showings, as on the surface of the *Vanguard*, are very good. The claims are worth prospecting and the prospecting should be very thorough before underground work is continued.

**Kitsault River Mining and Development Co., Ltd.**

This company was organized in 1924 with a capitalization of $1,000,000, divided into 1,000,000 shares. The registered office is in Alice Arm. The company's holdings consist of eight claims, situated on the west side of the upper Kitsault river, adjoining the *Homestake*, about 8 miles above the north end of the *Dolly Varden* railway. On the *Silver Tip*, in a volcanic breccia, is a well-defined siliceous zone, sparsely mineralized with pyrite, sphalerite, and galena, on which 30 or 40 feet of drifting and crosscutting has been done. The vein is very much sheared and broken in places. It strikes south-east and dips about 65° S.W. Values are said to run about 5 oz. of silver to the ton.

On the *Matilda*, farther south along the hillside, is a broad silicified zone, striking S. 80° W. and dipping at about 90°. The uppermost cut at 4,350 feet elevation is not very well mineralized, but a cut a short distance below carries 4 feet of fair-looking ore. A sample across the 4 feet assayed: Gold, trace; silver, 2.20 oz. to the ton; lead, 6 per cent.; zinc, 9.3 per cent. The ore occurs in a fractured volcanic breccia, the finer matrix of which has been replaced by the sulphides, leaving fragments of porphyry isolated in the ore. A tunnel and crosscut just below the good ore-shoot did not appear to have encountered much in the way of strong sulphide mineralization.

The outcrop of siliceous and rusty material is 25 or 30 feet wide. Before any more underground work is done several open-cuts should be made across the zone in order to determine its length, width, and values. The primary ore comes right to the surface, so that samples taken in such cuts will be just as good as those taken underground; and surface-trenching will give more information for the same amount of money than will underground work.

On the *Fox*, still farther south, a 2- to 4-foot vein of chlorite and pyrite, striking south-west and dipping steeply to the north, can be traced for a considerable distance on the surface. A small part of the ore on the dump from a drift on the vein consists of galena, pyrite, sphalerite, chalcopyrite, and a pink silicate, and is apparently from a short narrow lens within the main vein. The chlorite-pyrite part of the vein is said to carry small values in gold.

In addition to these showings there are others which I did not have time to see. The "Spar" vein is said to have been traced for 3,000 feet, but I understand that very little work has been done on it. With so much general mineralization in the country it seems worth while spending a small amount of money in uncovering the veins along the surface, to see whether or not they carry commercial ore-shoots of any size. If any are found it will be time enough to start on underground development.

**Esperanza Mines, Ltd. (N.P.L.).**

This company was incorporated in October, 1927, with a capitalization of $500,000, to operate the *Esperanza* property, one of the oldest in the camp, situated about a mile from Alice Arm, on the west side of the Kitsault river. The registered office of the company is in the office of E. H. Mortimer, Prince Rupert. Very little work has been done on the property this year and it was not examined. A shipment of 7 tons of ore was made to the Trail smelter during the summer. A little over 4 tons of this was high-grade ore assaying 0.27 oz. gold and 152.2 oz. silver to the ton, and the remainder was second-grade ore carrying 0.13 oz. gold and 40.3 oz. silver to the ton.

## PORTLAND CANAL MINING DIVISION.

The Portland Canal Mining Division includes all that territory in British Columbia which is tributary to Portland canal, as well as the upper drainage-basins of the Nass and Unuk rivers. Seven mining sections are recognized in the Division, as follows: Portland Canal (Proper), Georgia River, Marmot River, Bear River, Meziadin Lake, Salmon River, and Unuk River sections. Practically all the activity in the Division is centred around the head of Portland canal, in the Salmon, Bear, and Marmot River sections, although prospectors are beginning to take more interest in outlying sections, such as Meziadin lake, and in the area around Tide lake, both on the Nass River slope. The Georgia River section is coming to life slowly. The Unuk River section has not been made accessible by good trails and is quite inactive, although it is recognized as being a very promising area for prospecting.

The Portland Canal Division is one of the most important in the North-western District, not only because the *Premier* mine is situated within its boundaries, but because a great number of prospects are being actively developed by prospectors, small exploration companies, and larger operating companies. Not all of these prospects can hope to become mines, but there are

a few which will undoubtedly produce a considerable quantity of metallic wealth within the not-too-distant future. Although the district around the head of Portland canal has been prospected for twenty-five years, and intensively prospected for the past seven years, new discoveries are being made. Some of these are on ground that has been staked for years, while others are on new locations.

For the Portland Canal (Proper) section there is very little to record, except the curtailment of production from the *Outsider*, operated by the Granby Consolidated Mining, Smelting, and Power Company. The Georgia River section has not been very active, although it would seem to be a fairly important prospecting area. In order to make the upper end of the Georgia River valley more accessible a trail is being built up Bulldog creek to the head of the Georgia river, where most of the activity was centred this year.

The Marmot River section is developing into an active and important little district. The transportation problem has been immensely simplified by the completion of the wagon-road to the forks of the river and the construction of a bridge across the North fork. Development-work has been carried on vigorously at the *Prosperity*, *Porter-Idaho*, and *Washington*, and quite a little underground work was done on the property of the Marmot Metals Company and the *High Grade*. The prospectors who have ground in this section are spending a great deal of time in prospecting their ground more thoroughly, while others are spreading out from the head of Marmot river south towards Hastings arm and easterly towards the Nass river.

For a short time the Bear River section had a producing mine in the *Dunwell*, but unfortunately its ore reserves became exhausted before the year was over and the mill closed down. This would probably have put a very serious check on the developments in the Bear River valley if the Consolidated Mining and Smelting Company had not taken an option on the *George* copper property situated at the head of the valley. And the discovery of small but high-grade ore-shoots on the *Silverado*, at the lower end of the valley, also helped to keep up interest in this section. If the reconditioning of Sir Donald Mann's short-line railway should materialize it will mean much to the prospects at the upper end of the valley, for most of these promise to be low-grade propositions requiring cheap transportation for successful operation. If transportation facilities had been available the value of the *George* would have been determined years ago and the development of other properties would have been stimulated.

This year about 2,200 feet of diamond-drilling was done on the *George* by the Consolidated, but the work had to be suspended before conclusive results could be obtained. Some tunnel-work was done under the copper-showing on the *Red Top;* the Ore Mountain Company is still driving its crosscut; and some underground work has been done on the *Dalhousie*. Lower down the valley the L. & L. has been working steadily on a drift-tunnel, and on the *Albany* a small crew was drifting on a strong vein before some trouble in the company brought the operations to a close. The new strike on the *Silverado* may be of some importance, especially if the shear-zones carry milling-ore as well as the high-grade lenses. In addition to these operations, many prospectors have been busy on their claims doing the necessary assessment-work and prospecting. Intensive prospecting is needed on all the claims which are staked. New veins, or mineralized zones worth opening up, have been found this year on nearly half the properties visited during the summer, and each of these properties has been staked for at least fifteen years.

The Meziadin Lake section was not examined this year. The persistent rumours that the railway was to be extended to the Bear river-Nass divide is turning the attention of prospectors to this section, and undoubtedly it will be prospected if anything is done on the railway.

Most of the production from the Division is from the *Premier*, in the Salmon River section, and consequently this section has received quite a bit of attention from mining men. Probably the most important event in the year was the discovery of ore in the north-easterly extension of the *Premier* ore-zone, on the Sebakwe ground. An event of more general interest to the community, however, was the fact that the Consolidated Mining and Smelting Company had assumed the responsibility of developing the *Big Missouri* property. It is considered that the property has possibilities, but that it will probably be an expensive one to prospect thoroughly, so there is a great deal of satisfaction in seeing it taken up by such a strong and experienced company as the Consolidated. The Bush Consolidated Company has carried on exploratory work during the summer. Tunnelling was done on the Outland-Silver Bar and on the *Woodbine*. Work on the *Silver Tip* consisted of tracing the veins with surface trenches and doing a small amount of underground work.

One interesting and encouraging feature about the development of the Salmon River and other active sections in the Portland Canal Division is that the prospectors are spreading out into new territory, and what is equally significant is that exploratory engineers are following the prospectors into their more remote discoveries. The Tide Lake area, beyond the head of the Salmon river, on the Nass slope, is being prospected and with some success. Judging from inquiries which have come in, there will probably be more prospectors in this section next year.

The Unuk River section, unfortunately, is not one of these remote districts which is receiving the attention of the prospectors. It is too remote at present, although undoubtedly an extremely promising area for prospecting. The showings which have been discovered around Tide lake are not much more than across a ridge from streams which flow into the Unuk, but this ridge is glacier-clad and is a formidable barrier to prospectors. Topographical boundaries, however, did not restrict those agencies which were responsible for mineral-deposits and there is every reason to believe that important discoveries will be made in the Unuk River section when it is opened to the prospectors.

During the past summer George Hanson, of the Geological Survey of Canada, has been conducting a detailed investigation of the properties in the Bear and Salmon River sections and completing the mapping of the areal geology. His report will be both interesting and valuable, for he is very familiar with the ore occurrences and mining possibilities of the Eastern Contact Belt, having examined most parts of it between the Skeena and the Salmon rivers.

### Georgia River Section.

**North Country Mining Co., Ltd.**

This company, with registered office in Vancouver, was incorporated in 1923 with a capitalization of $2,000,000, with shares at $1 par value each. It is being financed by a group of Dakota business-men. The company's holdings consist of fourteen claims and two fractions—*Glory Nos. 1* to *8*, *Julia Nos. 1* to *4*, *Peggy Nos. 1* and *2*, and *Glory Fraction Nos. 1* and *2*—covering the mountain which lies in the angle between Bulldog creek and Georgia river. A good cabin with accommodation for half a dozen men has been constructed near the workings at an elevation of about 2,900 feet. Although about 1,000 feet of tunnel has been driven on the property, all the supplies have been back-packed over a 3,300-foot ridge, down to the Georgia River divide to 2,500 feet elevation, and up to the camp, at a cost of 15 cents a pound. The pack-trail, which is now being constructed up Bulldog creek and into the head of Georgia river to encourage prospecting in these areas, will be of material benefit to the North Country Mining Company.

The principal showings of the property were examined on July 16th in company with A. Linke, the superintendent in charge of operations. A crew of three men was engaged in driving a long crosscut tunnel to cut two or three mineralized zones in diorite, exposed along the top of the mountain, 1,000 feet or more above the portal of the tunnel. These mineralized zones, which are fairly numerous southerly along the ridge, are apparently brecciated lenses in the diorite of the Coast Range batholith, striking north-westerly (mag.) and dipping at steep angles. The centres of some of these zones are so completely altered that all traces of the original rock texture has been destroyed and the mineralized zones are referred to as mineralized dykes, but since the margins of the "dykes" grade laterally into silicified and pyritized material and finally into the diorite cut by a few veinlets of quartz and sulphides, it seems apparent that the ore-zones are merely brecciated zones in the diorite which have been silicified and mineralized. These zones, or veins, are up to 25 feet wide and are said to have a very considerable length, but in a few places at least a careful inspection shows unmineralized ground between exposures which are alleged to be on the same vein. So little surface work has been done that it is difficult to determine the actual extent, let alone the values, of any one vein.

The sulphide contents of the veins are not high and consist dominantly of pyrite, with small amounts of sphalerite and galena. One vein contains some chalcopyrite; another has a higher proportion of sphalerite; and a third is reported to carry fair gold values in places. Four tunnels have been driven on the property, with a total footage of about 1,000 feet.

No. 1 tunnel, about 250 feet below the camp, is a short crosscut into a flat ledge, which carries some gold values on the surface. The tunnel hit broken and soft ground and was discontinued.

No. 2 tunnel, about 100 feet above camp, is a drift 285 feet in length along a narrow vein of sphalerite. At 60 feet from the portal a diagonal crosscut was driven about 33 feet and found little knots of sphalerite throughout the vein.

No. 3 tunnel, about 500 feet above the camp, is the crosscut which is now being driven to tap the veins outcropping on the crown of the mountain. At the time of my visit it was in a little over 600 feet and was estimated to be within 150 feet of the first vein.

No. 4 tunnel is a short crosscut, started with the intention of cutting the copper-bearing vein outcropping in a section of the hill exposed to snowslides.

Apparently the long crosscut, No. 3 tunnel, is being driven to cut veins which are not known to carry values, for practically no surface work has been done on these veins. These veins may possibly carry values, but before starting a 1,000-foot crosscut much surface-trenching and sampling of the surface should have been done, especially since the veins outcrop on the top of a bald mountain, well above timber-line, where there is practically no drift.

I was informed later in the summer that a lead-showing had been uncovered from which shipments could be made by pack-train next year. The results of these shipments will be awaited with interest.

**Glory Extension.**

The *Glory Extension* group, consisting of eight claims—*Glory Extension Nos. 1* to *8*—it situated on the east side of the upper Georgia valley, occupying the remainder of the ridge south of the North Country Mining Company's ground. It is owned by A. Linke, of Hyder, Alaska. On the *Glory Extension No. 2*, at an elevation of about 2,800 feet, and about opposite the centre of the northerly of the two larger lakes, is a sheeted zone in the diorite, which has been silicified and cut by numerous stringers of quartz. In places it carries appreciable pyrite and occasional specks of sphalerite and galena. This vein, or ledge, is about 3½ feet wide and is reported to carry small values in silver. The strike is N. 20° W. (mag.) and dip 30° to 35° easterly into the hill.

On the *Glory Extension No. 8*, at an elevation of about 4,100 feet, nearly opposite the north end of the lower lake, a similar ledge has been exposed by an open-cut. The mineralization is similar to the ledge exposed on *No. 2* claim, but in addition to the low silver values the upper ledge is said to contain fair values in gold. At one point the mineralized zone widens to 2 feet. The strike is S. 60° E. (mag.) and the dip varies from 35° to 60° south-west. In addition to these two specific veins mentioned there are a number of zones on the top of the hill in the diorite, similar to those already described as the principal showings on the North Country Mining Company's ground.

Unless better values are found on the surface and the continuity of the various ledges is definitely established, the showings cannot be regarded as encouraging discoveries. More surface work is needed.

**B.C. Verde.**

This group, owned by Hugh McGuire, is situated on a ridge between the headwaters of Georgia river and Portland canal. The showings are reached by a steep foot-trail which goes straight over the ridge from Burnt point, on the east side of Portland canal, a mile or two below Bulldog creek. Just on the crest of the ridge, at an elevation of about 3,200 feet above sea-level, several trenches and open-cuts have been made in very rusty outcrops of highly metamorphosed volcanic rocks. Throughout the broken material which has been taken from the cuts occasional blocks of heavily mineralized material occur, containing variable amounts of chalcopyrite, but on the whole the amount of copper would be very small. The chalcopyrite is associated with pyrite and pyrrhotite. Lower down the hill, on the canal side, small specks of chalcopyrite, as well as one or two small veins, were noticed in the metamorphosed volcanics. The rock in which the mineralization occurs is a small roof-pendant of dense greenstones, agglomerates, and finely bedded tuffs resting on the batholith. Along the section of the hill followed by the trail several large blocks of the greenstones are found in the batholith from tide-water to about 2,300 feet elevation, and from there on to the summit about 3,250 feet, and down the other side of the ridge to 3,100 feet, the rocks are dominantly greenstones cut by an occasional dyke or protuberance of the batholith.

The showings themselves are not particularly encouraging, but indicate that roof-pendants in this section of the batholith are mineralized to a certain extent.

**Monday.**

This is a group of claims which has been staked recently near the head of Bulldog creek by Dan McDonald, of Anyox. The owner claims to have uncovered some lead-zinc showings, but time was not found to examine them

during the summer. Other groups have been staked in this creek in the past, but none of them have been examined by a Government engineer. The trail which was started up this creek in 1927 to get into the head of the Georgia River valley will open up a considerable area of favourable prospecting-ground. Many of the creeks in the district cut through such steep-walled canyons in places that it is very difficult for prospectors to take in their prospecting equipment until some sort of a trail is built.

### Marmot River Section.

**Marmot Metals Co., Ltd.**

This company, with registered office at Stewart, was incorporated in 1925 with a capitalization of $1,500,000, divided into 3,000,000 shares. The company's property consists of the *Montana* group of five claims and the *Horseshoe*, which are all situated on the north side of the South fork of Marmot river, about 5 miles from tide-water. The trail up to the foot of the hill, below the principal showings, is a good horse-trail with easy grades all the way, but from there on up it is narrow and steep, consisting in one place of a 20-foot vertical ladder. Some assistance has been given by the Mines Department for improving the upper part of the trail.

The showings which have received the most attention within the last two or three years are a group of zinc veins in a faulted block of limestone on the *Horseshoe* claim. The block of limestone is probably 300 feet wide and outcrops at the end of the mountain between 3,600 feet and something more than 4,000 feet elevation. Other fault-blocks of the same band of limestone are to be seen lower down, and north of this, as shown on the right of the accompanying photograph. At the base of the hill on the left of the photograph (south) is the main north-easterly contact of the Coast Range batholith.

Within about 100 feet of the north side of the limestone rock are three fairly continuous veins and a number of small lenses of zinc ore. The northerly vein is very close to the north contact and can be traced from the bottom of the limestone block at 3,600 feet elevation to about 4,000 feet, with the exception of about 100 feet in the middle, which is apparently cut out by the adjoining igneous rocks. The vein is from 3 to 12 feet wide and will assay from 2.5 to 12 per cent. zinc. The other two veins are about 50 and 100 feet south of the one just described and are similar to it in every way, except that they are only about half as long. Widths run from 1 to 13 feet and values from less than 2 to 13 per cent. zinc. An odd speck of galena and some pyrite can be found, but the dominant and only mineral of importance is sphalerite. Silver and gold values are unfortunately very low and the ore is therefore a straight zinc ore.

A number of open-cuts have been made across the veins and two tunnels have been driven. The upper tunnel is on the middle vein, or is really just north of it, and contains no ore. The lower tunnel is at the bottom of the northerly vein. It has several turns and totals about 90 feet in all; so far it has failed to find anything of value. The veins in this limestone block are so very well exposed naturally that tunnels are unnecessary to open them up for sampling.

The company does not intend to operate, but is merely trying to "dress up" the property for sale. Cuts at regular intervals along the veins, which will give examining engineers an opportunity to take samples a foot or two below the surface, are all that is necessary. One can then determine the length of and values in the veins and decide whether or not it has a chance of making a mine. I understand that there are other veins on the *Horseshoe* claim containing good silver-lead ore. If this is true, these veins should be opened up along the surface for inspection, rather than spend time in driving tunnels on veins which are already well exposed.

In the past a narrow vein on the *Montana* claim received quite a bit of attention, and a tunnel has been driven on a narrow lens of zinc ore on the *Peach No. 1* claim, but these have been fully described in earlier reports and need no further mention.

**Engineer.**

The *Engineer* group, consisting of five claims—*Engineer*, *Engineer No. 1*, *Engineer Fraction Nos. 1*, *2*, and *3*—is situated below the *Washington*, just above the glacier on the South fork of the Marmot, and is owned by Henry Bunn, of Stewart. Just up-stream from the turn in the valley, in a belt of fairly hard, dense, brittle argillites, the locator has discovered several narrow lenses carrying small but variable amounts of galena, sphalerite, pyrite, quartz, and calcite. The best one examined is at an elevation of 3,100 feet, but its full width has not been exposed. It strikes N. 60° W. and dips southerly into the hill at a flat angle. A short distance from this, by digging into the bank, the deep-red iron oxide is found which is typical of the oxidized outcrops of the silver-lead veins. Some galena was found in this material. The width of the vein should be determined

at this point and if it is at all well mineralized or well defined it should be followed by open-cuts along the surface.

Some work has also been done on a quartz vein near the cabin. This is a 6- to 8-foot vein in argillites a very short distance north-east of the main contact of the Coast Range batholith. It is stated in a previous report that this vein had a nice showing of copper at the portal of a small tunnel. There is, however, very little showing at present in the face of this tunnel.

Last winter a tunnel was started, at the foot of the slide which comes down from McGee pass, to pick up the vein at this point. On account of snowslides, it is the only place where work can be carried on in the winter. It was intended to drift along bed-rock under the talus and pick up the vein at a point below the first tunnel. This will be a long and difficult operation for one man and I doubt if it is worth while.

The indications found higher up the hill to the north should be followed up in preference to all others.

**Washington.** The *Washington* group, consisting of seven claims—*Ellen, Ruth, Vivian, Carrie, Black Bear No. 1,* and *Castle Hill*—is situated about 7 miles from tide-water on the east side of a small stream which flows north-westerly from McGee pass to the South fork of the Marmot river, and is owned by Ralph Lundwall, Captain McDonald, and associates. All the principal showings are in metamorphosed volcanic rocks a short distance from the main contact of the Coast Range batholith. A considerable amount of underground work has been done in an attempt to pick up the downward extension of three parallel veins exposed on the surface. The veins strike about N. 22° W. and dip steeply to the east. Nos. 1 and 2 veins are separated by but a few feet of waste and No. 3 vein is approximately 50 feet east of the other two. The veins are cut off abruptly on the south by a north-easterly striking fault which dips at an undetermined angle into the hill. All the crosscut tunnels and workings were apparently under this fault at the time of my visit and consequently were in barren ground. A survey of the veins, fault, and workings would be of great assistance in helping to determine the position of the veins on the tunnel-level and in helping to lay out the cheapest prospecting programme. The veins are leached to an undetermined depth and practically no surface work has been done along their outcrop.

Specimens from a mass of chlorite in the batholithic rocks across the creek from the camp are said to have given returns of from $4 to $20 a ton in gold, but the values must be very erratic, for the sample which I collected contained but a trace of gold. The chlorite-mass is apparently a metamorphosed basic segregation or inclusion in the batholith and is of very doubtful value as a prospective ore-body.

Since my visit near the end of July the underground work has been continued, but with what results I have not learned.

**High Grade.** This group is situated at the head of McGee pass, about 8 miles from tide-water, at an elevation of 4,000 to 5,500 feet, and is owned by H. Ficklin and W. Harner, of Stewart. It consists of seven claims—*High Grade Nos. 1, 2,* and *3, High Grade Extension Nos. 1* and *2,* and *Apex Nos. 1* and *2.* Although several veins are said to have been discovered, attention has been confined to three veins known as the upper, middle, and lower veins. All the veins are found on the east side of McGee pass in a series of metamorphosed argillites and volcanics, a short distance from the main contact of the Coast Range batholith. The upper vein, at the greatest distance from the contact, is very persistent, and consists of a series of massive sulphide lenses and more sparsely mineralized zones of quartz and silicified country-rock.

In places along the surface, presumably where the sulphides were chiefly pyrites, the outcrop contains very little besides limonitic material, while at other points massive lenses of galena are found, which are reported to contain good values in silver. The vein strikes about N. 75° W. (mag.) and dips into the hill (north-east) at 45° to 55°. It has been traced by a series of open-cuts for a considerable distance, and a short crosscut and drift have been driven under one of the principal showings containing galena. At the time of my visit (July 28th) an 18-inch shear-zone was showing in the face of the drift. A short crosscut to the left, a few feet from the face, had not found anything better.

The middle vein, standing about parallel to the upper vein, has been exposed by a surface cut at one point, which shows it to consist of a fairly wide zone of silicified and brecciated argillites, containing numerous lenses and veinlets of quartz and sulphide, chiefly pyrite. The

hanging-wall section is most heavily mineralized and from the gossan of this section some nice specimens of free gold have been obtained.

The lower vein, approximately parallel to the others, has been traced for a few hundred feet along the surface and found to cross from argillites at the north end to volcanic rocks at the south. It is up to 7 feet wide and consists of quartz, silicified country-rock, and variable amounts of pyrite. At one point chalcopyrite is conspicuous, while sphalerite and occasional specks of galena are also found.

**Dominion.** This group, consisting of ten claims and owned by George Brown and associates, of Stewart, is situated on the south side of the North fork of the Marmot river, just about opposite the *Porter-Idaho*. A 350- to 400-foot crosscut tunnel is being driven through fine-grained crystalline rocks of the volcanic series, with the expectation that a few small lenticular veins outcropping on the cliffs above the tunnel will come together at depth.

**Porter-Idaho Mining Co., Ltd.** The Porter-Idaho Company was incorporated in January, 1925, with a capitalization of $2,000,000, divided into 4,000,000 shares of the par value of 50 cents each. The registered office is in Stewart. The company's holdings consist of seven claims—*Gem of the Mountains, Lucille, Slide, Nettie L., Prickly Pear, Sunday*, and *Never Sweat*—and are situated on the north side of the North fork of the Marmot river. Although this is an extremely interesting and important property, time could not be found to examine all the numerous workings and showings. Quite a little underground work has been done in an attempt to block out a quantity of shipping-ore and permit a more extensive scale of operation to be carried out, but, unless recent drifting has found shipping-ore, very little high grade has been blocked out by the deeper workings. It is not surprising that but little shipping-ore was found, and the failure to find it does not mean that the property is not an excellent prospect, for "shipping-ore" in this case means ore that will run better than 200 oz. of silver to the ton.

In 1925 a 300-foot crosscut was driven to two parallel veins close together, and in 1926 500 feet of drifting was done on one of these veins, which is said to have developed a very good grade of milling-ore. The vein at this depth, 100 feet and more below the surface, contains much oxidized material in places. During the past summer another crosscut was being driven from the east side of the big snowslide gulch and somewhat below the camp in elevation. In July, when the property was examined, the tunnel was nearly through the fault-zone, which finds expression on the surface as a hollow paralleling the contour of the hill alongside the camp. A vein, which is presumably the one being driven for, outcrops a short distance uphill from this. Shortly after leaving the district I heard from reliable authority that the vein had been reached and contained high-grade ore. Drifting was started immediately, but I do not know with what results. This tunnel will give something like 450 feet depth on the vein. Exposures on other veins are traced to 1,400 feet vertically above this tunnel, so the known vertical range of mineralization is appreciable for a high-grade silver-lead property.

The money for doing this underground development-work has come in part from the sale of stock and in part from shipments of high-grade ore. Since the company is holding nearly half the shares in the treasury the ore shipments have had to provide for the development-work during the last two years. The result is that the company cannot get things rolling fast enough, so much time and energy being required to find and mine bunches of high-grade ore that are exposed on the surface or found in shallow workings. Under those conditions the management is to be commended on the showings that have been made, although it is regrettable that so much high-grade ore has had to be mined and shipped before transportation and mining costs could be reduced by larger-scale operations.

At the time of examination work was being done on a showing of high-grade ore up near the *Porter-Idaho-Prosperity* line, at an elevation of about 5,300 feet. Three tunnels had been driven on the vein within a vertical distance of about 60 feet. The ore had been mined from above the upper tunnel and a raise had been put through to it from the middle tunnel, preparatory to stoping. This block of ore between the two tunnels was mined out during the summer and, I understand, shipments were made from the high grade encountered in the crosscut referred to above. Aside from these, there are a number of small workings on other veins from which shipments have been made in the past.

The veins on the property are sheared and brecciated zones from a few inches to several feet wide. In most places examined they are heavily oxidized and the texture of the vein-matter is rather difficult to determine. That part of the oxidized matter which is deep rich red colour is referred to as "carbonate" ore and contains high-grade silver values. None of this material has been examined microscopically to determine the silver minerals present. In this rusty material lumps of galena are found, carrying high silver values. Aside from the red oxidized material, which really is not very conspicuous until dug into, the courses of the veins are marked by a black manganese oxide, which occurs as a thin film on the joint-planes of the wall-rock for a foot or so on either side of the vein.

The primary vein minerals consist of quartz, and presumably some manganese mineral, galena, sphalerite, tetrahedrite, and probably other silver minerals. The so-called tetrahedrite is probably freibergite, for picked specimens of it will run as high as 2,000 to 3,000 oz. of silver to the ton. The high-grade ore occurs as lenses of massive sulphides from a few inches wide and several feet long to lenses 2 or 3 feet wide and 60 feet long. Since primary deposition there has been some movement along the veins, which has resulted in a fracturing of the quartz, a development of gneissic banding in the galena locally, and is probably responsible for some of the gouge which is always present on one wall or the other. It is not known whether this secondary shearing along the veins, with its inevitable fracturing, is responsible for the peculiar distribution of the oxidized material in the vein, or whether it can be attributed to some other cause. In more than one place workings have started in solid primary ore at the surface and gone down into heavily oxidized material. I was able to examine only one such outcrop of the primary ore at the surface, and it was observed that there was not much gouge on the walls and the galena did not show much sign of stress. It is possible that fracturing has been greater at a lower level. Other suggestions might be offered, but it is better to wait for further information.

The veins appear to be irregular in width, attitude, and evidently, from the above description, in the distribution of values. One vein, outcropping just above the camp at about 4,200 feet elevation, strikes north-south (mag.), but on tracing it up the hill to 5,300 feet elevation the strike changes to N. 40° W.

Another vein, a few hundred feet west, from which ore was shipped this summer, strikes N. 20° W. (mag.) and dips west at 30° to 60°, and is therefore about parallel to the upper part of the one just mentioned. Other veins on the property were not examined.

The veins occur in a series of fairly acidic volcanic rocks consisting of breccias and occasional lenses of water-lain tuffs.

**Prosperity.** In the fall of 1926 it was discovered that one of the high-grade ore-shoots discovered on the *Porter-Idaho* extended into the *Prosperity* ground. The owners immediately commenced operations and shipped 29 tons of ore, which ran over 400 oz. of silver to the ton and contained nearly 30 per cent. lead and 11 per cent. zinc. The Premier Gold Mining Company immediately took an option on a 52-per-cent. interest in the property, and after driving a crosscut to the vein this summer took an option on another 24-per-cent. interest. The property consists of seven claims and what others may have been added this year by the Premier Company.

The showing consists of a 5- to 6-foot vein of massive sulphides, chiefly galena, with some zinc, argentiferous tetrahedrite, and probably other silver minerals. It strikes N. 20° W. (mag.) and dips 60° westerly. This is the upper part of the ore-shoot on which the *Porter-Idaho* was working during the summer. A tunnel driven to cut the vein at a depth of 80 feet found a considerable amount of oxidized material, although the ore-shoot on the surface is quite solid and fresh. A large amount of supplies were taken in during the fall, so that a 1,500-foot crosscut could be driven during the winter to cut the vein at greater depth.

A very substantial dry wall-stone building was constructed during the summer and enough supplies taken in to last till spring.

### Bear River Section.

**Silverado Mines, Ltd.** The Silverado Mines, Limited, with registered office in the Pemberton Building, Victoria, was incorporated in 1924 with a capitalization of $500,000, divided into 500,000 shares. The company's holdings consist of nineteen Crown-granted mineral claims, situated at the head of Portland canal on the east side, overlooking the town of Stewart.

At intervals, over a period of years, a considerable amount of money has been spent in attempting to find commercial ore-bodies in a series of relatively flat veins outcropping on the *Silverado* ground, but without very gratifying results. Within the past year, however, the prospective value of the property has been enhanced appreciably by the discovery of an entirely new set of veins, outcropping immediately below the tip of a small glacier which extends down a steep snowslide gulch and creek canyon to about 3,500 feet above sea-level. The more conspicuous showings of ore were undoubtedly covered by this glacier until the last year or two.

The veins occur in a series of volcanic rocks within a fairly short distance of the main north-eastern contact of the Coast Range batholith. They consist of a series of more or less parallel shear-zones from a few inches to several feet wide, mineralized with variable amounts of lead and zinc sulphides and silver minerals. These sulphides occur both as disseminations throughout the vein and as narrow lenses of massive sulphides, constituting a high-grade silver ore. The general strike is N. 70° W. and dip varies from 60° to 75° to the south-west.

The most important discovery made so far is the No. 1 vein, which outcrops just to the north of the glacier's tip at an elevation of about 3,400 feet. It can be traced downhill for about 300 feet in elevation, and possibly farther, but the lower end is not very pronounced. The upper end is covered with ice. The vein in general is a narrow shear-zone from 12 to 24 inches wide, but it widens in several places to 3 or 4 feet, where narrow hanging-wall stringers impinge on the vein. Just below the glacier the vein contains a nice lens about 150 feet in length of massive lead-zinc sulphides and averaging slightly over 1 foot in width. Eight samples from this lens gave an average value of 220 oz. of silver and from 0.08 to 0.22 oz. of gold to the ton. In addition to this, the ore will carry from 5 to 8 per cent. lead and about 10 per cent. zinc. Ruby silver is conspicuous in some of the cuts and is undoubtedly responsible for a part of the silver content. Some of it occurs on joint-cracks and would appear to be secondary, but I am not prepared to say that the greater part of the silver values are secondary. A microscopic examination of the ores would help to determine whether the primary silver minerals are present in appreciable amounts.

No. 2 vein outcrops in a canyon about 200 feet south-west of No. 1 vein. It was understood at the time of the examination that the showing in the canyon represented the junction of Nos. 1 and 2 veins, but from a survey kindly forwarded to me by the management it is apparent that the veins are quite separate and distinct. The vein can be seen in the canyon of the creek which comes out from under the toe of the glacier. It is a shear-zone 12 to 15 feet wide, mineralized with small amounts of lead and zinc sulphides. It had not been opened at the time of my visit, but was to receive attention before the summer was over.

No. 3 vein outcrops 150 to 200 feet northerly (along the bottom of the glacier) from No. 1 vein and is a strong shear-zone from 3 to 6 feet wide which can be traced continuously from the glacier at 4,000 feet elevation down to at least 3,200 feet elevation, and it probably continues farther in either direction. This vein does not contain massive lenses of sulphide within this distance, but at various points small amounts of the common sulphide minerals are found. The vein had not been opened by cuts at the time of my visit.

No. 4 vein is a foot-wall split from No. 3 vein. At an elevation of about 3,450 feet one very small and narrow lens of sulphides has been discovered, and at another point, a few feet above, a number of very beautiful specimens of native silver have been obtained from a section of the vein measuring about 1 by 3 feet. Five samples from the lens of sulphides, which is about 30 feet long and slightly less than 1 foot wide, averaged 145 oz. of silver to the ton, and one sample assayed for lead and zinc gave 9 per cent. lead and 22 per cent. zinc.

The principal sulphides in the veins are galena and sphalerite, but, in addition to these, pyrite is a conspicuous mineral and small but variable amounts of ruby silver, argentite, and native silver are found. The argentite and native silver are undoubtedly secondary and are responsible, to a certain extent, for the high values obtained in the samples.

In the late part of the summer 14 tons of ore was shipped from the surface of Nos. 1 and 4 veins, for which the smelter returns amounted to a little over $1,000.

The property undoubtedly has merit, even although the tonnage of commercial ore indicated at present is quite limited. Nos. 2 and 3 veins should receive more attention, for it is possible that they may contain milling as well as small high-grade lenses similar to those discovered on Nos. 1 and 4 veins. It is popularly believed that the *Silverado* has no transportation or development difficulties, because it is situated on a side-hill overlooking Portland canal. While this is

relatively true, it must be borne in mind that the veins outcrop in the middle of a steep snow-slide gulch, making it necessary to drive a fairly long crosscut tunnel from one side or other of the gulch if mining activities are to be carried on for more than a few months in the year. Before this is attempted several cuts should be made on Nos. 1, 2, and 3 veins and the values in these veins determined, avoiding as much as possible all traces of secondary enrichment.

**Bayview Mining Co., Ltd.**

This company was incorporated in March, 1925, with a capitalization of $250,000, divided into 1,000,000 shares having a par value of 25 cents each. Capital was increased later to $750,000 in 3,000,000 shares. The registered office is in the Rogers Building, Vancouver. The company's holdings consist of fourteen claims on Mount Dolly, about 2 miles north of Stewart, on the west side of Bear river. A part of the claims are the old *Bayview* group and constituted the original holdings of the company, but later the *Thompson* group was acquired. It was on this group that A. B. Trites did some work two years ago. An excellent 14- by 24-foot cabin has been built at about 2,750 feet elevation.

The claims cover a part of the main contact of the Coast Range batholith. The showings on the original *Bayview* group are up above timber-line, at about 4,000 to 4,500 feet above sea-level. One narrow vein lies along the granodiorite contact; another outcrops about 500 feet above the contact in well-bedded tuffs. (The tuffs lie on top of a small flat part of the batholith.) The vein is small and contains narrow lenses of galena and sphalerite, which carry some silver and low gold values. Other flat and irregular veins are found higher up the hill. One flat-lying lens contains high-grade silver ore, but it cannot be mined except to take out a few sacks on the surface.

The best showings are the two veins which have been discovered on the *Lucille No. 1* claim of the *Thompson* group. The lower of these two veins is about 1,000 feet around the hillside northerly from the cabin and very little above it in elevation. About 150 feet in length the vein is well exposed by surface-stripping, which shows it to vary from 2 to 5 feet in width and to contain appreciable amounts of sphalerite and galena. The vein actually consists of a number of both parallel and irregular stringers of massive sulphides, which coalesce in places, forming large replacement benches of ore within a very well-defined zone in the granodiorite. The strike of the vein is about N. 80° W. (mag.) and the dip varies from about 50° at the east end to a somewhat steeper dip at the west end. The country-rock is heavily impregnated with pyrite for a considerable distance on either side of the vein. The east end of the vein is well within the granodiorite, but the west end is apparently just about on the contact between the granodiorite and the volcanics. The stripping has shown the vein to continue westerly to a fair-sized creek, but it apparently does not continue beyond this point into the highly altered and pyritized rocks which outcrop on the west side of the creek. These rocks are a phase of the batholith and outcrop in a series of brightly stained bluffs for several hundred feet north-west of the creek. A 35-foot diagonal crosscut has been driven towards the east end of the vein, but the face of the crosscut was still in the pyritized granodiorite at the time of my visit. It was continued to the vein later in the summer and is reported to have cut a few feet of low-grade ore.

The upper vein on the *Lucille No. 1* outcrops about 100 feet in elevation above the vein just described and lies entirely within the volcanics. It strikes more nearly north-west than the lower vein and has been traced by open-cuts for several hundred feet up the hill and into the *Gold Cliff* ground. The dip is steep into the hill, or north-east. The east end of the vein, as exposed, is about a score of feet from (west of) the granodiorite. The section of the vein from here as far as the creek which marks the west end of the lower vein is rather narrow. At the point where the creek crosses the vein a foot-wall branch is considerably wider and shows at the top of a cut about 3 feet of fine-looking lead-zinc ore, which is said to run as high as $200 to the ton in gold, silver, lead, and zinc. The massive sulphides in the lower part of the cut, however, are quite narrow. While picking around in a small draw some 50 feet east of this cut a small but nice streak of massive galena was discovered. The east end of the vein should be opened up with more surface cuts. The foot-wall branch of the vein has not been traced far to the west, but the hanging-wall branch has been stripped for 150 feet or more north-westerly along the side of the creek, and cuts showing more or less mineralization have been put in at intervals along the strike of the vein on the *Gold Cliff* ground. This section of the vein is a narrow shear-zone in the volcanics, containing lenses of sphalerite and galena and silicified rock with pyrite.

Between 90 and 100 feet of underground work has been done on the east end of the vein. About half this work is a diagonal crosscut and the other half is supposed to be a drift along the vein, but as a matter of fact the drift crosses into the hanging-wall of the lead it was intended to follow. I did not take samples from this group, but G. A. Clothier has reported as follows:* "A few pieces of galena from the face assayed: Gold, $10.80 to the ton; silver, 112 oz. to the ton; lead, 38 per cent.; zinc, 16 per cent."

The vein drifted upon, however, is erratic, and I am not at all sure that the crosscut was driven far enough to catch the vein exposed on the surface.

Although selected specimens of massive sulphides from the lower of these two veins will not carry as high a proportion of silver, the property should be attractive to leasers. A little cross-cutting from the drift on the upper *Lucille* vein could be done to advantage in order to make sure that the right vein has been found. A short crosscut a few feet to the left should be sufficient. The property should be very carefully prospected for other veins.

**Gold Cliff.** The claims grouped under this property are twelve in number—*Gold Cliff Fraction Nos. 1, 2,* and *3, Gold Cliff Nos. 1, 2, 4, 5,* and *6,* and the *Tom, Barney, Margaret,* and *Jerry Dog.* These claims lie on the north-west and west side of the *Bayview* property and are owned by W. Dann, N. M. Dann, and Jim Douville, of Stewart. The property was visited on July 13th in company with W. Dann, one of the owners, but it was impossible to see a great deal of the showings on account of snow. The only vein which we attempted to follow was the upper *Lucille* vein of the *Bayview* property, which has been described under the *Bayview* group.

A few open-cuts made along the strike of the *Lucille* vein have disclosed variable amounts of mineralization. The uppermost cut, which is said to have exposed a good vein of high-grade ore, is at an elevation of about 3,600 feet. Unfortunately this cut, which is in the bed of a small stream, was completely filled with snow and we were unable to see the vein. A short crosscut had been driven into the bank of the stream and apparently into the hanging-wall of the vein. If the values are as good as reported the vein should be stripped in order to determine the length and value of the ore-shoots.

In addition to this vein, W. Dann claims to have good copper-showings in a very heavily pyritized area outcropping a short distance north along the side-hill, but the showings were covered with snow and could not be examined.

**Ruth and Francis.** This property, consisting of ten claims—*Ruth, Francis, Francis No. 2, Copper King, Little Johnnie, Lucky Jim, Nine of Hearts, Copper King No. 2, Beatrice,* and *Windsor*—is situated on the North fork of Glacier creek, about 7 miles from Stewart, on the east side of Bear river. The principal interest in the property is owned by Jim Nesbitt and Andy Archie, and with them are associated Alex. McInnis, Duncan McLean, and Mrs. McLean. There is an excellent pack-trail from the *Dunwell* camp as far as the *Lakeview* property, but from then on the trail is steep in places and not in particularly good condition. A new trail which was being constructed in 1927 will cross a few hundred feet below the *Ruth and Francis* cabin and will give better means of access to the property. The elevation of the cabin is about 3,500 feet.

Three veins were examined on July 4th in company with Jim Nesbitt, one of the owners, and the man who is responsible for the development-work. The veins are all in argillites. Across the North fork of Glacier creek from the cabin and a little lower in elevation a small steeply dipping north-south vein has been opened in three or four places. It is mineralized with pyrite and galena, as well as sulphantimonides, and is reported to carry good values in silver. The second and most important vein outcrops in and along the walls of the creek. It is said to extend continuously from the *Silver Bow* property, a few hundred feet in elevation below the *Ruth and Francis* cabin, up to the glacier several hundred feet above the cabin. Owing to the heavy fog and drizzle it did not seem advisable to attempt an examination of the upper end of the vein. It strikes north-east (mag.) and dips steeply to the south. About 100 feet below the cabin a drift has been driven along the vein for some 60 feet. After going in about half this distance a full face of ore was exposed in the tunnel. Rather than take the ore out and have it lost down the creek the drift was swung over to the left and continued along the wall of the vein. The bunch of ore left in the jog of the tunnel is a very pretty vein, about 6 feet wide, heavily mineralized with massive jamesonite and other sulphides. A sample across this

* Annual Report, 1925. Reported under *Gold Cliff* group.

assayed: Silver, 31.6 oz. to the ton; lead, 15 per cent.; zinc, 18 per cent.; antimony, 8.3 per cent.

Approximately 75 feet lower in elevation a second drift is being driven along the foot-wall of the vein, from which holes are being put into the vein at intervals to test its width and values. The vein so far exposed in the lower tunnel varies from a few inches to about a foot in width and is said to contain good values in silver, lead, and zinc.

Crossing this north-easterly vein about 25 feet south-west of the portal of the upper drift is a 1-foot vein of quartz, striking N. 60° W. (mag.) and dipping steeply to the south-west. The values in this are negligible, although small amounts of galena are found in places.

The values and the width of the ore-lens exposed in the north-easterly vein warrant further prospecting of this vein. Underground work is so slow and expensive that one is led to suggest that the prospectors should do as much surface work as possible, although the present plans of drifting under the wide ore-shoot along the lower level is well worth while. It might be advisable, however, to crosscut the vein from the face of the upper tunnel to see whether or not the ore-shoot holds its width for that distance.

**L. & L. Consolidated Mines, Ltd.**

This company represents a consolidation of the L. & L. Glacier Creek Mines, Limited, and Rush Columbia Mines, Limited. The property controlled by the company consists of some twelve claims extending from the Middle to the North fork of Glacier creek. In the past quite a bit of drifting has been done on a narrow vein in greenstones outcropping up near the tip of the glacier, which comes down into the North fork of Glacier creek. A raise has been put through from No. 1 to No. 2 level and a third level was started down near the glacier. In addition, a small shipment of high-grade silver-lead ore has been made. All these various workings are described in some detail in previous Annual Reports.

During 1927 the upper tunnel was being driven along a narrow streak of silver-lead ore, too small to be commercial. Work in the tunnel was started from a point where a cross-fracture had been encountered. This was considered to be a fault and crosscuts were driven to right and left, but without finding the vein, which, however, was found by continuing the drift through the slip. About 140 feet had been driven up to October 8th.

Two men were employed in uncovering a vein on the old Rush Columbia claims on the Middle fork of Glacier creek. The vein has been traced by open-cuts for several hundred feet on either side of the creek. It strikes south-west (mag.) and dips north-west at a steep angle. Only recent cuts on the south side of the creek were examined. The vein is up to 6 feet wide and consists of quartz and calcite chiefly, with a few inches of iron and sphalerite on either wall. A 10-inch streak on the east wall at one point assayed: Gold, 0.2 oz. to the ton; silver, 31 oz. to the ton; lead, *nil;* zinc, 12 per cent. A sample across 1 foot on the other wall contained but 1.6 oz. of silver to the ton and 1 per cent. zinc. In places pyrrhotite is a conspicuous vein-mineral and at other points bunches of galena and an exceedingly fine-grained grey sulphide are found. In the cuts examined there is nothing of commercial value, but the vein is well defined and worth a certain amount of prospecting.

**Albany Mining Co., Ltd.**

This company was incorporated in October, 1925, with a capitalization of $900,000, divided into 900,000 shares of the par value of $1 each. The registered office is in Vancouver. The company's property consists of three claims —*Albany, Raven,* and *Lucky Boy Fraction*—situated on the South fork of Glacier creek at about 1,700 feet elevation. Development-work was started early in the summer and a camp was partly completed near the workings, but difficulties in financing the company seemed to arise and all work was suspended before the season was more than half over.

The property was examined after it was closed down, so many of the showings may have been missed. Just above the trail an open-cut has been made on a vein which strikes N. 65° W. (mag.) and dips 50° S.W. In the face of the cut is a 6-inch vein mineralized with quartz, pyrite, galena, and sphalerite. Below the trail are several other openings and workings. The most important is the work which has been done on a vein which outcrops in the South fork of Glacier creek for a short distance below a falls. The vein, which is possibly one of those exposed higher up the hill near the trail, strikes about N. 50° W. (mag.) and dips westerly with the hill at 20° to 35°.

Although the vein outcrops along the creek-bed as far as the falls, a drift was started just a few feet above the creek and in attempting to follow the vein broke through into the

creek in two places. After the second break-through the drift was turned back into the bank and continued altogether in the foot-wall of the vein for 40 or 45 feet and then turned back to pick up the vein. From the face of this crosscut one can hear the gravel being washed down the creek very distinctly. Before continuing the crosscut the relative positions of the crosscut and falls should be determined, for if a break-through is made at the falls the tunnel will be flooded and made useless. From inspection it would seem that the margin of safety, if any, is small.

The vein as exposed in this working is from 5 to 8 feet wide and is well mineralized with pyrite, sphalerite, and contains some galena. Quartz is the principal gangue mineral. Large vugs lined with quartz crystals are numerous. It is said that the values are fairly good, but I did not sample the vein. It is certainly strong enough and would make a nice milling-ore if it carries the values. I would suggest that moil samples should be taken across the vein at 5-foot intervals by a competent engineer, and if the results of this sampling indicate a milling grade of ore an attempt should be made to develop the property. There are difficulties to be contended with in mining, for the vein is flat in places and if parts of it were mined out the whole hillside would move.

**Emperor Mines, Ltd.**

This company was incorporated in December, 1924, with a capitalization of $1,500,000, divided into 1,500,000 shares, the registered office being in the Standard Bank Building, Vancouver. The claims owned by the company are situated north of the *Lakeview*, or about straight up the hill from the *Dunwell*. I do not believe anything has been done on the property since late in 1925. The showing is a wide silicified ledge in argillites, mineralized with small amounts of iron, lead, and zinc sulphides. Small specks of chalcopyrite can be found and in one of the surface cuts a number of small patches of a fibrous mineral were observed, which may be jamesonite.

Very little work has been done on the surface, but several hundred feet of crosscutting has been done. At an elevation of 3,130 feet No. 1 tunnel was driven 120 feet to the vein, cutting it at 80 feet below the surface, and drifts were run both ways for 30 feet along the hanging-wall side of the vein. Sulphides are rather inconspicuous, except in the face of the south drift, where sphalerite and a little galena can be seen. Rather than continue drifting on this level, No. 2 tunnel was driven to intersect the vein about 300 feet south and 250 feet lower than No. 1 tunnel. This was driven 470 feet to the hanging-wall of the vein and continued another 33 feet, about 21 feet of which is ledge-matter. No drifting has been done on the vein from this tunnel. Samples taken in the crosscut indicate that the values are very low, running about 50 cents in gold to the ton, 1 to 3 oz. in silver to the ton, 3 to 7 per cent. zinc, and less than 2 per cent. lead.

A new vein is said to have been discovered higher up the hill, but as nothing has been done on it I did not examine it.

**Kenneth.**

The *Kenneth* group of five claims, *Kenneth* and *Kenneth Nos. 1* to *4*, inclusive, is the old *Mobile* property which has been relocated and held by A. P. Gibson and L. Legge, of Stewart. In 1922 and 1923 the property was owned by the Mobile Mines, Limited. This company did several hundred feet of drifting on the main vein and demonstrated to its own satisfaction that the property was worthless. There seem to be some bunches of high-grade ore remaining, however, and prospecting by the present owner has resulted in the discovery of one or two new mineralized zones. The property is situated on the south side of Glacier creek, about 3 miles in a direct line from Stewart.

In the past a considerable amount of work has been done on a vein in the argillites which outcrops just behind the camp at an elevation of 4,100 to 4,300 feet. The lower tunnel is about 520 feet long. At about 125 feet from the face 25-foot crosscuts were driven right and left in barren argillites. There is nothing showing in the face of the tunnel and, judging from the material on the dump, very little mineralization was encountered in the underground workings.

Openings along the surface are a little more encouraging. For about 200 feet from the lower (No. 1) tunnel to No. 2 tunnel a few openings expose a vein in the sheared argillites, mineralized with some galena, sphalerite, and pyrite. No. 2 tunnel is about 60 feet long and has followed a few inches of lead-zinc ore. In a cut about 50 feet along the vein, and therefore about over the face of the tunnel, is a nice vein 3 feet wide, which was found on sampling to contain: Gold, 0.02 oz. to the ton; silver, 42 oz. to the ton; zinc, 4 per cent. About 40 feet farther along the vein is a third tunnel 45 feet long. The vein, as exposed along the back and in the face of this tunnel, is very badly broken and is quite narrow, but it is reported that high-grade ore has been found in the working. This is probably true, for a sample taken from a small bunch of ore

exposed in the lower left-hand corner of the face assayed more than 300 oz. silver to the ton, and in addition contained 12 per cent. lead and 18 per cent. zinc. The sample width was 1 foot. It is evident that the vein is very lenticular and ore of this type undoubtedly occurs in but small ore-shoots, but since it is right at the surface and in ground which is easy to work it should be followed up. Beyond this upper tunnel the vein can be picked up at intervals for several hundred feet, but it is very lean.

For the most part the vein is very narrow and not particularly promising in appearance, but it is possible that a small amount of high-grade silver ore might be shipped from shallow surface workings. The long drift (No. 1 tunnel) and crosscuts from it would seem to show that little can be expected at depth, but the workings should be surveyed to make sure that the vein has not been missed in the underground work. When driving in slate it is very easy to get off on the wrong slip and miss the real vein.

Several hundred feet south of the vein just described, over near Barney's gulch, a small amount of work has been done on a silicified and mineralized zone in greenstones, just below the slate-greenstone contact. Arsenopyrite is the principal sulphide. A chip sample taken from the surface outcrop, and therefore containing quite a bit of oxidized material, assayed: Gold, $7.20 to the ton; silver 5 oz. to the ton. Although it is possible that a large part of these values may be due to secondary enrichment, some more work should be done on the showing. I would suggest two or three surface cuts to be made along the strike of the zone, so that samples can be taken of the unoxidized vein-matter. The lens would not appear to be very long, but its length should be determined. Other lenses might be found along the same zone.

A third showing is found a few hundred feet south of the camp and at about the same elevation as the camp. In a small creek-bed a mineralized zone in the argillites has been opened by a wide shallow cut. The strike of the ledge is difficult to determine in this one cut, but it appears to be about parallel to the first vein described. The mineralized area is some 15 feet wide and contains several stringers and bunches of quartz, sphalerite, and some galena. A 2-foot sample from the south side assayed: Gold, trace; silver, 11.2 oz. to the ton; lead, *nil;* zinc, 9 per cent. This is by no means an average, but merely indicates the type of mineralization in one of the more highly mineralized sections of the ledge. It would be worth while following this ledge with surface cuts.

**Dalhousie Mining Co., Ltd.**

The Dalhousie Mining Company, Limited, was incorporated in 1925 with a capitalization of $1,000,000, divided into 1,000,000 shares, but within the last year the capitalization has been increased to $2,000,000. The registered office is in the Permanent Loan Building, Victoria. The company's holdings include the *Dalhousie* and the *Rock of Ages* groups, each of eight claims, situated on the west side of Bear river, opposite Bitter creek, and about 9 miles from the town of Stewart. In 1925 a good camp was built on a bench at 2,700 feet elevation.

During the past summer and up to the time of my visit on October 4th the company had driven a total of 110 feet of drift and crosscut on the No. 1 vein zone in an attempt to determine its width, continuity, and values underground. The vein, which is a silicified zone in the greenstones, containing considerable pyrite and a small amount of chalcopyrite, has been exposed by surface-trenching at two points. These indicate that the vein crosses the hill at a very sharp angle, striking about N. 70° W. (mag.) and dipping rather steeply to the south. The lower of the two cuts, just above the portal of the tunnel, shows the mineralization to be upwards of a score of feet wide and it is said to run about $8 a ton in copper and gold, chiefly the latter. The upper cut is some 50 feet higher and exposes 7 or 8 feet of well-mineralized ground. A sample at this point assayed: Gold, 0.10 oz. to the ton; silver, 1.4 oz. to the ton; copper, 1 per cent. A few feet south of this cut is another small vein, said to contain good values in gold.

The drift on No. 1 vein was started just below the lower cut, on the hanging-wall side of the vein, and driven for a short distance along a slip which was believed to be the hanging-wall of the vein. The direction of the slip, however, carried the tunnel out of the mineralized ground and into the hanging-wall. After losing the values a crosscut was started and driven 25 feet into the hanging-wall to explore for the narrow vein, which was mentioned as occurring a few feet from the upper cut, and the main tunnel was turned slightly to the right and driven on a course which carried it back towards the vein at a small angle. At the time of examination some silicification and sulphide mineralization were making their appearance on the right-hand side of the face, indicating a possible close proximity to the vein. It was suggested that cross-

cutting at this point would give valuable information. The results of such work, if carried out, have not been ascertained.

On the hillside just behind the camp and extending for some distance along the side-hill is a line of cuts on what is referred to as No. 2 vein. Only one of these cuts was visited, the one directly behind the camp and some 200 feet above it, where a tunnel has been faced off and driven a few feet along the vein. The apparent strike at this point is north-easterly and the dip is nearly vertical. The other exposures said to be on this vein would indicate a north-south strike. It is quite possible that more than one vein is represented by the series of outcrops and open-cuts. The vein, where examined, is a silicified zone in the greenstones mineralized with vein quartz, pyrite, magnetite, and some chapcopyrite.

Above and a little south of the No. 1 vein zone a broad belt of mineralization, made conspicuous by its numerous iron-stained croppings, crosses the mountain in a north-westerly direction. Approaching the zone from the north, at an elevation of 3,200 feet, there is first a silicified zone in the greenstone, about 3 feet wide, well mineralized with pyrite and chalcopyrite. The vein is about parallel to No. 1 vein, striking about N. 70° W. and dipping at 50° to the south. A 3-foot sample assayed: Gold, 0.80 oz. to the ton; silver, 1.2 oz. to the ton; copper, 2.1 per cent. A short distance uphill, across a rubble-covered bench, are two rusty croppings, either one of which might be the continuation of the vein, or they might represent separate lenses.

Some 50 yards south of the showings just mentioned a 30-foot granite dyke is found in the middle of the broad belt of mineralization. It is flanked on either side by a series of irregular and lens-shaped zones of silicified ground, mineralized with pyrite and some chalcopyrite. Very little surface work has been done on these exposures. On following the zone north-westerly up the mountain it is found to merge into an extensive area of brightly stained schist. This, however, is not silicified and probably does not contain values of any kind.

At the head of a big gulch above the iron-stained schist and at about 4,100 feet elevation is the south end of a north-south vein, known as No. 4 vein. It dips westerly into the hill at about 75° and is apparently parallel to the bedding, for it follows the lower side of a narrow band of limestone. The vein is mineralized with pyrite, some chalcopyrite, and in places with more or less sphalerite. Lack of time and a covering of fresh snow prevented an examination of other showings on the property.

The number of veins and the fact that some of them carry good gold and fair copper values indicate that the property has no small prospective value. It would seem desirable to do a great deal more surface work in order to determine the size, continuity, and values of the various zones before attempting to open up by underground methods one particular vein whose length and continuity has not been established. The very number of the showings makes this imperative, and the fact that most of them are at or above timber-line, with very little overburden, makes it a relatively easy task. If the crosscut on No. 1 vein encountered ore, drifting on this ore might be carried on at the same time that the surface work is being done, but, of the two, I think the latter is the more important, for there is much valuable information to be obtained by stripping, sampling, and mapping all the ore occurrences. When this is done a campaign of underground work or diamond-drilling can be laid out intelligently, providing the surface work should indicate the advisability of more extensive prospecting and development.

**America's Girl.** This property, consisting of twelve claims, is situated on the spur between Bear river and Bitter creek, about 7 or 8 miles from Stewart. The cabin is about 100 feet from the motor-road and 100 yards or so below the Bitter Creek bridge. The property is owned by Chas. Duke, Howard Campbell, and Joe Cullen, all of Stewart. About 400 feet above the cabin, in what is apparently a medium-grained contact phase of a granitic intrusion, some open-cuts and stripping has uncovered a zone in which is a narrow lens of quartz and pyrite. At another point is some slightly pyritized material, apparently a part of a highly altered inclusion.

From about 100 feet above these workings, to at least 1,400 feet elevation, a series of highly metamorphosed greenstones are found, mineralized in places with disseminated pyrite. Near an old cabin about 900 feet above the road, or at 1,500 feet elevation, a 2½-foot vein has been opened up with short tunnels on either side of a small creek. The vein strikes about east-west (mag.) and stands nearly vertical. On the west side of the creek a small amount of chalcopyrite is found, but on the east side the vein is barren of sulphides, consisting only of coarse-grained

white quartz. Near the cabin are zones of quartz veinlets and silicified areas, but the sulphide content is very low.

Several hundred feet east of the upper cabin, at an elevation of about 1,750 feet, 85 feet of underground work has been done on a quartz vein from 2 to 4 feet wide. About 60 feet of this work is a crosscut through barren greenstones, the remainder being a drift along the vein. It is very similar to the last vein described and no more promising.

**Keystone.** This group is situated on the east side of American creek, a mile or so above its confluence with Bear river. The group is owned (in part at least) by Sam Deschamps, of Stewart. The showing consists of a sheared and silicified zone in greenstones, in which good values are reported to have been found. This zone outcrops in a small creek and strikes about east-west (mag.), dipping steeply to the south. A tunnel is being driven as a diagonal crosscut from near the water-level in a small canyon on American creek. At the time of examination it was in 40 feet and a few stringers of galena were coming in. The wall-rock is greenstone.

**Terminus Mines, Ltd.** This company was incorporated in 1924 with a capitalization of $1,000,000, divided into 1,000,000 shares of $1 each par value. The registered office is in Victoria. The company acquired the *Terminus* group from the original staker, H. A. Heywood. The claims are situated at an elevation of 3,400 to 4,100 feet, about 20 miles from Stewart and 5 miles from the end of the Bear River wagon-road. Northeasterly from the camp, at an elevation of 3,940 feet, a crosscut has been driven 370 feet to the principal vein on the property. This vein was cut at 330 feet from the portal and three narrow stringers were cut between this and the face. From the main crosscut a drift was run 48 feet north and two parallel drifts were driven southerly, within the vein zone, along narrow stringers. Some ore has been broken in a narrow stope above the north drift, and from the hanging-wall of the two southerly drifts a raise has been put through to a sub-level which had been driven previously from a shaft. The sub-level is 50 feet below the surface and the main level is about 50 feet deeper.

The main vein is an intensely silicified zone up to 15 feet wide, carrying narrow stringers and larger lenses of high-grade silver ore from a fraction of an inch to 2 or 3 feet wide. The larger lenses, and the part which is being drifted on as the vein proper, is a narrow sheared zone within the wider silicified ledge. The ore in this is more or less continuous, although decidedly lenticular and generally very narrow. This same pay-streak and each of two other narrow streaks of ore cut by the crosscut is accompanied by a narrow basic dyke, which is apparently later than the ore. The strike of the main vein varies from N. 30° to N. 55° W. and the dip is about 65° N.E.

A few samples were taken in order to obtain some idea of the distribution of values and the tenor of the ore. A 9-foot sample of the silicified ledge on the foot-wall side of the vein in the lower crosscut assayed: Gold, trace; silver, 6.6 oz. to the ton. One very narrow stringer of sulphide was included in the sample and another stringer of similar material was avoided. A 5-foot sample of silicified ledge-matter on the hanging-wall side of the vein assayed: Gold, trace; silver, 0.6 oz. to the ton. A sample across 2 feet 8 inches in the end of the stope just above the main crosscut assayed: Gold, trace; silver, 60.4 oz.; lead, 4 per cent.; zinc, 8 per cent. This is the width of the stope and represents everything that would have to be broken in mining. Values elsewhere in the stope might be entirely different. The vein in the face of the southerly drifts is completely oxidized and could not be sampled and the face of the other drift was blocked with muck. In the face of the south drift on the 50-foot level there is 2 feet of nice-looking ore on the hanging-wall side and 1 foot of crushed and oxidized material on the foot-wall. The 2 feet of ore assayed: Gold, trace; silver, 11.2 oz. to the ton; lead, 16 per cent.; zinc, 10 per cent. The foot of oxidized vein-matter assayed: Gold, trace; silver, 8.6 oz. to the ton; lead, trace. In the shaft from the sub-level to the surface there is a narrow massive vein of sulphides from 2 to 8 inches wide, which is said to assay over 125 oz. silver to the ton.

About 250 feet south of the vein described above is a second mineralized zone, known as the "quartz ledge." The principal showing on this is several hundred feet south of the shaft and workings on the other vein. The extreme south end of the quartz ledge is exposed on the side of a small creek-bed and consists of a 60-foot zone of altered greenstones, in which there are one or two massive quartz-barite veins, as well as numerous stringers of the same material.

An iron bearing carbonate is fairly plentiful and in places a small amount of lead and zinc sulphides are to be found. The zone strikes N. 10° to 15° W. (mag.) and dips 70° W. The largest, most continuous, and most highly mineralized quartz vein in the zone is along the hanging-wall side. The only other vein larger than a stringer occurs in about the middle of the zone. A 3-foot sample, representing the mineralized section of the hanging-wall vein, assayed: Gold, trace; silver, 0.4 oz. to the ton; lead, *nil;* zinc, 4 per cent.; not a very encouraging result. A sample of similar width from the other vein contained only a trace of each of the four metals.

The quartz ledge can be traced for a couple of hundred feet northerly before it disappears under the surface debris. Other smaller exposures can be found farther north along the strike, but nothing has been done to determine the width or values of the ledge at these points. A few open-cuts could be put in to advantage along the strike of this zone. In addition to these two main vein zones a few smaller veins have been discovered, but very little work has been done on them and they will not be described.

Some of the samples taken in the underground workings of the main vein are rather good. A return of 60 oz. silver from the 2-foot 8-inch sample at the end of the stope indicates good milling-ore at this point. The returns of 6.6 oz. silver from the 9-foot sample across the silicified hanging-wall section of the vein is sufficiently encouraging to warrant a careful resampling of this section along both sides of the crosscut, and if similar values are found it would be advisable to crosscut the vein zone at other points in an attempt to discover slightly better values. No reliance should be placeed in the result of this one sample. The sample from the face of the southerly drift on the 50-foot level indicates the possibility of developing a fair milling-ore over a width of 3 feet.

In the past the development-work has been done apparently with the idea of developing a narrow high-grade ore-body. I think it would be advisable for the management to resample all workings with a view to finding milling-ore, and not high-grade ore, for the silicified walls seem to carry some values.

**George Gold Copper Mining Co., Ltd.**

This company was incorporated in 1925 with a capitalization of $1,500,000, divided into 1,500,000 shares of the par value of $1 each. Its registered office is in the Pemberton Building, Victoria. The company's holdings consist of a large block of claims situated on the south side of Bear river, 6 miles from the end of the wagon-road. Descriptions of this property have been given in several previous Annual Reports. The Consolidated Mining and Smelting Company has taken an option on the property and has done about 2,200 feet of diamond-drilling during the summer. The drilling is to be continued next year, it is understood, but no definite plans have been announced by the Consolidated.

The showings occur at an elevation of 4,300 to 4,800 feet in a series of gently dipping volcanic rocks, consisting of flows, tuffs, breccias, and tufaceous argillites. Three veins have been discovered and prospected. These are known as the "Blue," "Jasper," and "White" veins. The Blue vein is a well-defined fissure-vein from 3 to 10 feet wide, striking N. 70° E. (mag.) and dipping south at about 65°. It has been opened by a number of good deep cuts for a distance of about 500 feet. The west end of the vein is covered with talus. The vein is rather well mineralized throughout with chalcopyrite and arsenopyrite in a gangue of quartz, beautifully banded jasper, and hæmatite. The arsenopyrite, which occurs as a narrow massive lens along one wall of the vein, carries some gold.

The Blue vein branches at the upper end. The hanging-wall branch runs a short distance and then pinches down to a stringer. The foot-wall branch continues for about 200 feet as the Jasper vein. It is from 4 to 5 feet wide and consists of finely banded jasper, carrying chalcopyrite, pyrite, and hæmatite. An easterly extension of this Blue and Jasper vein is represented by a zone in the greenstones cut by a network of narrow quartz stringers, carrying variable amounts of sulphides.

The White vein lies north-east of the Jasper vein and is really a zone cut by numerous stringers of quartz and sulphides, and might well be called a "braided" vein. Some of the cuts on it are very well mineralized with chalcopyrite, while others do not look so promising. Stretches of it between cuts appear to be barren, but it is said that the whole zone seemed almost barren until it was opened up with cuts.

Two diamond-drill holes were put down this year by the Consolidated Mining and Smelting Company, but the results were inconclusive. No. 1 hole was drilled to a depth of 1,174 feet, and No. 2 hole had to be abandoned for the season at 1,027 feet because the water for drilling became frozen. Work will be resumed next season.

**Enterprise.** The *Enterprise* group of eight claims is situated on Bear river, just west of the Bear-Nass divide, and is owned by L. H. George, of Stewart. A series of bluffs running along the hillside at about 3,100 feet elevation are stained with copper carbonates, and at one place a shot has brought down a considerable quantity of good-looking copper ore. The face from which the ore came, however, is not very well mineralized, except along a fracture-zone about 1 foot wide, which strikes north-west. A tunnel was driven into the bluffs behind the copper-showing for about 100 feet, but it did not seem to find much ore. This work was done years ago when the ground was staked as the *Lucky Frenchman* group.

Above the copper-showings at an elevation of 3,000 feet some work has been done by the present owner on a narrow and flat shear-zone which strikes about N. 60° E. (mag.) and dips north into the hill at a flat angle. Sulphides are not very plentiful and the showing is not particularly encouraging.

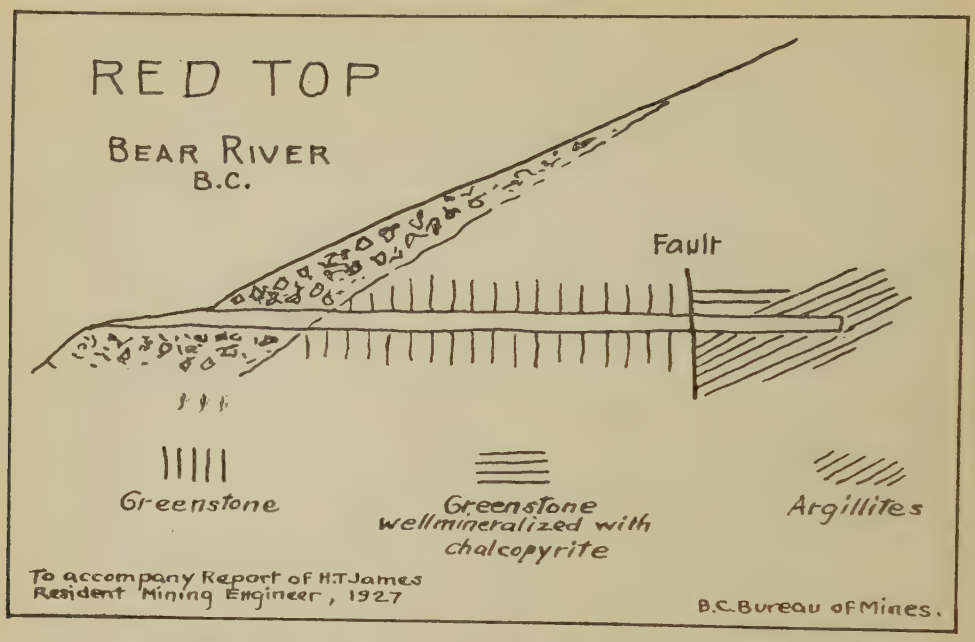
A third mineralized zone outcrops at the north side of a vertical cliff just above the talus and can be traced for several hundred feet up the hill. From a single exposure at about 4,100 feet elevation the ledge would seem to consist of about 20 feet of very fine-grained siliceous material, striking about N. 05° W. and dipping 30° to 40° E. The hanging-wall is marked by a strong shear-zone containing considerable gouge. This is the part that has been traced up the hill as the lead. The silicified rock under the shear-zone has been opened in one or two places and is found to be sparsely mineralized with pyrite, chalcopyrite, galena, and tetrahedrite. A chip sample from the walls of a 10-foot tunnel contained only a trace of gold and 0.8 oz. silver to the ton. A 6-inch vein of chalcopyrite lies along the foot-wall of the silicified zone at about 4,100 feet elevation.

The talus, below the line of cliffs at base of which the vein is found, contains a great number of large blocks of silicified and heavily pyritized material. A chip sample from a number of these shows, however, that the vein from which they have come is probably not important commercially, for it assayed only a trace of gold and 0.4 oz. silver to the ton. In the same talus there is float of another kind which assays very high in silver and would seem to be of some significance. So far the source of this float has not been found, but it is well worth looking for and is the most encouraging feature of the property. The copper-zone, however, offers some possibilities and should be prospected along its strike.

**Red Top.** These claims, owned by J. Conners, James McNeil, and John McNeil, are situated on the north side of Bear river, about 7 miles beyond the end of the Bear River wagon-road, nearly opposite the *George* property. The group consists of the *Red Top* group of seven claims—*Red Top, Red Top No. 1, Hector No. 1, Superior, Superior No. 1, Red Top Fraction,* and *Superior Fraction;* and the *Amazon* group of four claims —*Amazon* and *Amazon Nos. 1, 3,* and *4.* The *Red Top* group is surveyed but not Crown-granted.

Two types of showings have been found and prospected on this group. One is an irregular type of copper-deposits not very well understood as yet, and the other consists of clean-cut veins of lead-zinc ore. The copper-showings are situated in a draw near the cabin. On the westerly side of the draw a pronounced curving shear-zone, striking N. 45° to 70° W., crosses the bluffs. On the south-westerly side of it is a large and irregularly mineralized zone containing bunches of fair-looking copper ore. The rock through which the ore is distributed is both sedimentary (metamorphosed argillites) and volcanic (breccia), but the best grade of ore is in the volcanic rocks. The mineralized zone is broken by two or three cross-slips. A covering of fresh snow prevented a close examination of the structure. Argillites were not noticed on the north-east side of the main shear-zone, so it is probably a zone of displacement.

A 335-foot tunnel has been driven under this copper-showing. For a number of feet from the portal the tunnel is through talus. At 258 feet, after driving a considerable distance through greenstone, a narrow vertical break was encountered, striking north-west (mag.) and dipping at about 90°. Beyond this breach the tunnel is in mineralized greenstone for about 25 feet and is then in argillites to the face. The contact between the mineralized greenstone and the argillites dips towards the portal at about 25°. The argillites are barren, except for a few feet near




the face, where seams of calcite and some copper and iron sulphides are found. Unfortunately time did not permit a survey and correlation being made between the tunnel and surface exposures. From the fact that the mineralization starts abruptly at a slip or break, it is possible that this break may be a fault, and it may possibly be the same break as the prominent shear-zone found on the surface. The mineralization on the surface is on the south-west side of the break and underground it is on the opposite side. Detailed geological mapping might solve this problem and open up possibilities of finding a fairly large zone of copper mineralization. The property would be worth examining with this in mind. The sulphide minerals are chiefly pyrite and chalcopyrite.

On the opposite side of the draw from the tunnel, copper indications have been found in the greenstones during the past summer, but nothing has been done on these showings and they were not examined.

For a description of the lead-zinc showing the reader is referred to the 1920 and 1925 Annual Reports. At an elevation of 3,850 feet a 5- to 8-foot vein has been found, well mineralized with pyrite and galena. A 200-foot crosscut driven towards the vein at 3,500 feet elevation is said to be within 60 feet of the vein. A second vein, from 1 to 2 feet wide, heavily mineralized with galena, zinc-blende, and some chalcopyrite, has been found east of this vein.

**Dunwell Mines, Ltd.**

The company was incorporated in 1922 and is a specially limited reorganization of the Nass River Lands, Limited, which was incorporated in 1913. The capitalization of the Dunwell was originally $350,000, but it was doubled in 1925 and further increased in 1926 to $1,000,000, with 1,000,000 shares. The head office of the company is that of the Stewart Land Company, Limited, Pemberton Building, Victoria.

The fine new mill was tuned in early in the summer and was soon treating 140 tons of ore a day and making good recoveries. A lead concentrate containing about 72 per cent. lead, nearly 4 oz. gold, and 65 oz. silver was taken off the tables, and lead and zinc concentrates were made on two 12-cell M.S. flotation-machines. In the latter part of September all the known ore reserves in the mine became exhausted and the mill had to be closed down. During its brief period of operation it treated 27,067 tons of ore. The future plans of the Company have not been ascertained.

In the early part of July it looked as though a new vein, discovered in a granitic stock on the *Ben Ali* claim, might be important. It had been traced for several hundred feet and seemed to carry commercial values in copper and gold, but a drift on the vein proved very disappointing.

B.C. Silver Mines, Ltd.—Surface Plant.

Big Missouri Mine Camp, Portland Canal M.D.

Engineer Gold Mines, Ltd., Taku Arm, Atlin M.D.

Toric Mines, Ltd.—Mine Plant.

The company's personnel in Stewart consisted of Robert Stewart, general manager; Matthew Little, mine superintendent; W. D. Clinch, mill superintendent; and L. S. Davidson, accountant.

### Salmon River Section.

**Bush Consolidated Gold Mines.**

This company represents a consolidation of a number of claims, groups, and small companies in British Columbia and Alaska. The properties included in the consolidation are the *Border*, *Sunshine*, *Exchange* group, Extenuate Gold Mines, Limited, *Monitor* group, *Maple Leaf* group, Chief Metals Company (extent of interest not known), one-sixth interest in *Cobalt* group, and a number of new claims staked in the interests of the company at the lower end of Long lake. In addition, the company owns the *Gold Cliff Premier* property, situated in Alaska, adjoining the *Border* claim, which is in British Columbia. The company was incorporated in the State of Delaware in April, 1927, and registered in this Province in October of the same year. The capitalization is $3,000,000 and the shares are of the par value of 50 cents each. The head office of the company outside British Columbia is 210 Metropolitan Building, Toronto, Ontario, and the head office in British Columbia is at 375 Dunsmuir Street, Vancouver.

During the summer an active campaign of prospecting and development has been carried on under the direct supervision of G. A. Bancroft. In July some diamond-drilling was done on a mineralized zone on the *Border* claim at the point where the zone crosses the *Premier* wagon-road. The mineralization appears to be in a sheared phase of the intrusive porphyries, which are known locally as the Premier sills, but the unmineralized rocks on the walls of the zone are undoubtedly sheared greenstones of the volcanic series. The mineralization consists of disseminated pyrite and small stringers of sphalerite and quartz. The results of the drilling have not been learned.

When the consolidation took place work on the Extenuate Gold Mines, Limited, was being carried out to trace a vein on the surface with open-cuts after having driven 268 feet of crosscut during the winter. I did not learn what vein the crosscut had been driven to intercept. The only well-defined vein which I was shown on the surface was striking N. 75° W. and the crosscut was being driven S. 80° E. or nearly parallel to this vein. The tunnel is in greenstones and is quite barren. The surface showing which was examined is at an elevation of about 3,600 feet, or 600 feet above the camp. Only about 2 feet on the foot-wall side (south) had been uncovered, and this consisted of silicified material containing occasional specks of chalcopyrite. Very little has been done on these showings since the Extenuate Company was absorbed by the Bush Consolidated.

Aside from drilling on the *Border* claim, the company's efforts have been confined very largely to the tracing-out and prospecting of a series of siliceous zones along the east side of Slate mountain. Some of these zones are very prominent, standing up as ridges a score of feet high and as many feet wide, but it is found that these larger exposures are almost devoid of any indication of sulphides and consist principally of quartz and silicified country-rock. Where sulphides are present pyrite is the only one that is conspicuous. At some of the narrower points, where the siliceous zones are more like quartz veins, galena can be found. The principal zones strike about N. 25° W. (mag.) and dip westerly at fairly steep angles. They are crossed by a series of east-west zones of similar type. In the early part of the summer three holes were drilled on two of these zones up near the lower end of Long Lake valley, but the percentage of core recovered was small and but very little reliable information seems to have been obtained from the drilling.

Towards the latter end of September the buildings on the old *Extenuate* property were being moved down into Cascade creek, and re-erected on the *Sunshine* claim in order that development-work might be continued throughout the winter. It is planned to do about 600 feet of cross-cutting and drifting on two of the north-south zones where the best surface values have been found.

**Premier Gold Mining Co., Ltd.**

It is hardly necessary to say anything about the activities of the *Premier* mine, as it is an established mine producing continuously at a steady rate and paying regular dividends. The only interesting change which has been made in the property or in its operation during the past year is in the milling practice. No details of the change have been received, but it is known that the tables are to be eliminated. Production during the past year has been at the rate of about 800 tons a day, a little more than

half of which is milled, and the remainder, running more than $25 to the ton, is shipped direct to the smelter.

**B.C. Silver Mines, Ltd.**

This company was incorporated in October, 1919, with a capitalization of $1,500,000, divided into 1,500,000 shares. The head office is in the Pacific Building, Vancouver. The company owns two groups of claims, one at either end of the mining property of the Premier Gold Mines Company, Limited. The north group is the only one that has been developed as yet and it contains the north-easterly extension of the Premier ore-zone. In the past, as outlined in previous reports, a great deal of underground work and diamond-drilling has been done, resulting in the discovery and partial development of various ore-bodies. During the past year the underground exploratory work has been continued, but has not been pushed as vigorously as in the past, pending the results of the negotiations which have been conducted between the B.C. Silver, Sebakwe, and Premier Companies towards an amalgamation of the three companies. It would seem that the matter has not been settled yet.

**Sebakwe and District Mines, Ltd.**

This is an English company, registered in the Province in February, 1926, with an authorized capital of £200,000. Its head office in the Province is 612 Pacific Building, Vancouver. It acquired the old Bush property from the National Silver Mines, Limited, for a share consideration for the purpose of prospecting it for the extension of the Premier-B.C. Silver ore-zone. In 1926 a crosscut tunnel was faced off near Cascade creek on the *Lesley No. 6* claim and driven about 1,000 feet before the end of the year. This amount of tunnel was through barren tuffs. At about 1,000 feet from the portal the tunnel entered the *Premier* porphyry and began to pick up low-grade values. Within another 50 feet a nice ore-body was crossed. Drifting on this both ways proved it to be between 200 and 300 feet long on this level and to carry good values in silver. The crosscut was continued and quite a bit of prospecting has been done for other ore-bodies, and a raise was put through to one of the easterly workings in the B.C. Silver property.

The new ore-shoot on the Sebakwe property represents another find along the *Premier* north-easterly oze-zone and proves that this zone contains commercial ore-bodies over a distance of about 4,500 feet. To date three properties have found ore on this zone—namely, the Premier, B.C. Silver, and now the Sebakwe. Between the mineralized zones on the Sebakwe and B.C. Silver is a fairly wide granitic dyke which cuts off the mineralization sharply. The ore-body on the Sebakwe side of the dyke is quite a bit north of the line of the B.C. Silver ore-zone, and it is not known whether the two zones represent faulted sections of one original zone or are entirely different zones. It is possible that they are separate and distinct zones, because general silicification and mineralization has been found on the strike of the B.C. Silver zone on the north-east side of the dyke.

One very interesting feature about the discovery of the Sebakwe ore-shoot is that it is a blind ore-body capped by several scores of feet of purple tuffs, which did not contain a trace of mineralization on the surface. The ore is confined to an intrusive porphyry, as is most of the ore in the *Premier* ore-zone. The north-east end of the Sebakwe ore-zone is cut off on the tunnel-level by the tuffs, but it is not known how far the ore-shoot will rake to the north-east with the porphyry-tuff contact. Developments on lower levels will be followed with a great deal of interest.

**Woodbine Gold Mining Co., Ltd.**

This company was incorporated under the "Companies Act" of the Dominion of Canada with a share capital of 5,000,000 shares without par value. The head office is at 806–7 Vancouver Block, Vancouver. The property acquired by the company consists of the following claims and fractions: *Vancouver, Vancouver No. 1, Woodbine Fraction No. 1, Woodbine, Kitchener, Premier Fraction No. 2,* and the *A.C.C. Fraction.* The first two of these claims formerly belonged to the *Premier Extension* property, but they have been put in with the *Woodbine* in order to give a better grouping of the claims with respect to the known mineral-showings. All of these claims, with the exception of the last two, are Crown-granted, and these two are surveyed and ready for Crown-granting. The property is situated on the west side of Cascade creek, about a mile north-west of the *Premier* mine.

At the time of visiting the property (early in July) a crosscut tunnel was being driven to prospect for the downward extension of No. 2 vein, which outcrops about 80 feet above, at the

top of a bluff. Although the tunnel was in far enough to catch the vein on its dip, nothing had been found, and nothing had been found later in the summer, even although the tunnel had been extended considerably. The vein on the surface is strong and would be expected to go down to the tunnel-level. It had been opened in only one place and may prove to be a short pipe-like body. The open-cut and a short tunnel across the vein has exposed a mineralized zone 20 feet wide, striking about N. 35° E. (mag.) and dipping north-westerly into the hill at about 60°. The mineralization is within a sheared and silicified zone in volcanic rocks, which appears to be an inclusion in the intrusive porphyry, which is known locally as the "Premier sills."* The mineralization consists of disseminated pyrite, quartz, and pyrite veinlets, and one rib contains a considerable amount of sphalerite and galena. This is a very nice showing for this district and might be expected to contain good gold and silver values. It is unfortunate that more surface work was not done before attempting to explore for the vein underground.

The principal showing on the property, and the one that has received the greatest amount of attention, is a very wide silicified zone known as No. 1 vein. It appears to strike about parallel to No. 2 vein and dips into the hill, but the walls are so indefinite that it is difficult to determine its attitude. As a matter of fact, many in the district believe this zone does not strike north-east, but strikes north-west, and is actually a continuation of the *Premier* north-west mineral-zone. It is true that a series of zones can be picked up in line with the *Premier* north-west zone, but I doubt that they form a continuous zone. They seem rather to be north-easterly-striking zones located along some north-west structure. The streaks of mineral in No. 2 vein, for example, strike north-easterly. The ground between Nos. 1 and 2 veins is not silicified, as it should be if the mineralized zone strikes north-west. The lower tunnel on No. 1 vein has been driven north-westerly and has gone through a mineralized zone into barren rock, suggesting that the working is a crosscut.

The actual dimensions of No. 1 vein zone are not known. It apparently does not extend very far to the south-west and the north-easterly extension is covered with muskeg and cannot be followed in detail. There remains much to be learned about this zone. It is said to contain one or two high-grade streaks of ore, but these were covered and could not be seen.

The ledge crosses the old *Missouri* trail at a small angle. On the upper side of the trail two or three short tunnels have been driven into the ledge and discovered sufficient values to encourage more extensive work. From a point just below the trail a 130-foot crosscut has been driven through to the hanging-wall of the ledge. The portal of the tunnel is in ledge-matter. At about 100 feet from the portal a drift has been driven south-westerly and was in 42 feet on July 5th. The working was all in mineralized ground.

It is quite impossible to estimate the grade of the ore or to sample such a large zone, but three chip samples were taken from different parts of the zone and should give some indications of the average values, according to A. McKenzie, the superintendent. The results of these samples are as follows:—

Sample No. 1: Gold, trace; silver, 0.8 oz. to the ton; lead, *nil;* zinc, trace.

Sample No. 2: Gold, trace; silver, 6.6 oz. to the ton; lead, *nil;* zinc, 5 per cent.

Sample No. 3: Gold, 0.02 oz. to the ton; silver, 5 oz. to the ton; lead, *nil;* zinc, 5 per cent.

These values are very low, but are just about what would be expected from the appearance of the material. Although low they are good enough to warrant exploration of such a large zone. There is a possibility that higher-grade ore-shoots may be found.

The property is favourably situated geologically, has a big low-grade ore-zone which is worth prospecting, and is well equipped with compressor, blacksmith-shop, and camp buildings.

**Premier Extension.** This property consists of a small group of claims situated on the east side of Cascade creek, immediately north of the *Woodbine*. On the boundary between *Vancouver No. 1* and *No. 3* claims, just below the old *Missouri* trail, at an elevation of about 1,200 feet, is an outcrop of highly silicified material containing small amounts of pyrite and sphalerite and reported to carry low values in gold. The zone appears to strike about parallel with the hillside and to dip at a very flat angle into the hill, but sufficient work had not been done on the showing to enable one to determine its true attitude. Other showings up the hill were not examined.

* Schofield, S. J., and Hansen, G.: Memoir 132, Geology and Ore Deposits of Salmon River District, British Columbia; Geological Survey of Canada, 1922.

Northern Light.

This is a group of ten claims—*Northern Light Nos. 1* to *8*, *Northern Light No. 1 Fraction*, and *Northern Light Fraction*—situated in the angle between the fork of Cascade creek, a little over 13 miles from Hyder, Alaska. It is bounded on the west by the *Woodbine*, on the south by the *Premier*, and on the east by the B.C. Silver and Sebakwe properties, and therefore might be said to be well situated geographically. The property is owned by William Banting, of Hyder, Alaska, and partners. The property was bonded last February to J. O. Hayes, of Victoria, but nothing has been done on the claims during the summer.

The *Northern Light* ground is underlain chiefly by the *Premier* porphyry, or the porphyry which contains most of the ore in the *Premier* ore-zone. Other rocks found on the claims belong to the volcanic series into which the porphyry has been intruded.

In a small creek-bed, a short distance below the *Big Missouri* wagon-road, on the *Northern Light Fraction*, is a silver-lead vein from a few inches to 3 feet wide, striking about N. 80° W. and dipping 35° or 40° to the south. This particular lens is only about 40 feet long, but it is said that similar lenses can be found farther down the creek on the same strike. Small bunches of galena were seen about 3,000 feet farther down the creek, but the mineralized zone was not traced through. Considering the fact that the zone is in the *Premier* porphyry and not far from known valuable ore-bodies, it is worth prospecting carefully. The upper end of the vein is in the porphyry, immediately below the volcanics.

A much wider zone of mineralization is found on the *Northern Light No. 4* claim. A zone 20 or more feet wide in the slightly sheared porphyry is silicified and slightly mineralized with pyrite and sphalerite. On the east side of a small basic dyke which runs down the centre of the zone a tunnel has been faced off and driven a few feet along the vein. The foot-wall 2½ feet is well silicified and mineralized with pyrite and some sphalerite. A sample across this zone assayed: Gold, 0.10 oz. to the ton; silver, 8.4 oz. to the ton; zinc, 1 per cent. The hanging-wall section contains a little more zinc, but not so much gold or silver. A 5½-foot sample across this assayed: Gold, trace; silver, 4.4 oz. to the ton; zinc, 2 per cent. The section of the silicified zone on the opposite side of the dyke is not so well mineralized. It has been opened by a short crosscut a short distance south of the tunnel from which the samples were taken. I think it is unfortunate that no attempt has been made to trace this zone along the surface, for, although the values obtained are not high, it occurs in the *Premier* porphyry and is more or less parallel to the *Premier* north-east ore-zone. Under the circumstances the zone is certainly worth prospecting. It strikes N. 30° E. and dips about 80° W.

On the west side of East creek, running through claims *Nos. 5*, *6*, and *7*, is another slightly mineralized shear-zone in the porphyry. For a distance of 8 or 10 feet on either side of a basic dyke the slightly sheared porphyry is cut by stringers of sulphides and quartz. The strike of the zone is a few degrees west of north and the dip is at a moderate angle to the west.

Between the *Premier* and the *Woodbine* are showings of silicified and mineralized ground, which are thought to be continuous with the *Premier* north-west ore-zone, but from what I could see there has not been sufficient done on these to establish the continuity of the zone. However, it is evident that big bunches of silicified and mineralized ground do outcrop at intervals along the general strike of the *Premier* north-west zone. The first of these examined is on the *No. 5* claim, on the ridge between Cascade creek and its East fork. An open-cut has exposed a big mineralized showing in the porphyry, mineralized chiefly with sphalerite. The strike and dip of the zone could not be determined from this one exposure. A 7-foot sample across what appeared to be the strike assayed: Gold, trace; silver, 1.6 oz. to the ton; zinc, 8 per cent. Another 5 feet would carry about the same values in zinc and presumably similar values in silver and gold. Another big silicified outcrop occurs between this and the *Woodbine* workings.

It is said that a lens of high-grade silver-lead ore has been found on the old *Missouri* trail, right on the boundary between the *Northern Light* and *Woodbine* properties. This would be in the *Woodbine No. 1* vein zone, but on the *Northern Light* ground. Another showing is reported a little farther north-east along the same zone, and on the *Northern Light* ground. This north-easterly extension of the main *Woodbine* vein should be prospected.

Although none of the samples which were taken indicated the presence of commercial ore, I think the property is worth examining for two or three reasons. In the first place, the best-looking vein on *No. 4* claim carries fair values, but has not been prospected along its strike. In the second place, there is a bare possibility that this vein on *No. 4* claim might be traced

down to the *Premier* north-west zone and reproduce conditions which are known to have been so important in the *Premier* mine. The largest ore-bodies in the *Premier* occur where the north-east zone joins the north-west zone. The vein on *No. 4* claim strikes north-easterly, and there are a series of big mineralized outcrops on the strike of the *Premier* north-west zone, crossing the lower end of the *Northern Light* ground. It would therefore be worth while trying to trace one zone into the other when it is known that the best ores in the *Premier* occur at the intersections of similar zones. It is possible that a careful examination and survey of the property as it now stands might give all the information required, or it might be desirable to do some surface-stripping before forming an opinion as to the possibilities of the property.

**Buena Vista Mining Co., Ltd. (N.P.L.) (Big Missouri).**

This company was incorporated in September, 1927, to take over the *Big Missouri* group on the Salmon river, which was being developed by the Big Missouri Mining Company, Limited, a holding of the Standard Mining Corporation. This last is an extra-provincial organization with an authorized capital of $250,000 fully paid, while the Big Missouri Mining Company has an authorized capital of $5,000,000 fully paid, and the present company, the Buena Vista, has a capitalization of $500,000, with the shares of the par value of $1 each. The controlling interest in the Buena Vista Mining Company is owned by Consolidated Mining and Smelting Company of Canada, which is responsible for all further development of the property.

Late in 1926 S. A. Knowles was put in charge of the *Big Missouri* property, and although coming into the country when everything was covered with snow, and being obliged to continue the search for ore without the aid of the most valuable information obtainable on any prospect, the surface showings, seems to have accomplished a great deal. During the winter the work was of necessity confined to underground prospecting, sampling and testing the ground from the old *E Pluribus* workings. On the main tunnel-level 116 feet of crosscut was driven, and a 4- by 7-foot winze was sunk 56 feet. On the 100-foot level off the shaft 173 feet of driving was done. The north-west crosscut on this level cut a 20-foot zone, carrying low values in gold. The greatest amount of work was done and the most encouraging results obtained on the 60-foot level off the shaft. A total of 393 feet of drifts and crosscuts and 56 feet of raise were driven on this level. The north-east crosscut passed through 35 feet of good milling-ore just at the shaft, and beyond this intersected a broken zone carrying gold values. Drifts were later run along this fracture-zone, on either side of the crosscut, for a total distance of 60 feet, and although some values were found in the drift they were not as high as at the collars of the drifts.

In addition to the underground work on the *E Pluribus*, a short stope was driven on one of the showings on the *Buena Vista* and considerable work was done along the "calcite cuts." These last are on the east side of Harris creek just above the camp. Surface cuts have shown a mineralized zone to extend more or less continuously for a distance of about 400 feet and similar material is found in a cut several hundred feet farther north. These cuts and two tunnels, 58 and 70 feet in length, have found very erratic values in gold. A number of short diamond-drill holes were drilled in an attempt to follow the high values and determine the size and attitude of the pay-zone, but the results were not at all encouraging. It is strange and very disconcerting to find values so erratically distributed as they are on the *Big Missouri*.

It was at this stage that the Consolidated took over the control of the property. As soon as negotiations were completed work was started immediately on a sleigh-road and rushed to completion before the snow became too deep, and a crew of men was put on surveying and sampling all the workings. At present a tunnel is being driven under the calcite cuts and may be driven a considerable distance if anything encouraging is found.

The development of the *Big Missouri* will be followed with more interest than the development of any other property in the district, for it will mean a great deal to the whole Portland Canal camp if the Consolidated should be successful in making a mine out of this well-known property.

**Silver Tip Mining and Development Co.**

This company was incorporated in 1925 with a capitalization of $1,000,000, divided into 1,000,000 shares. The registered office is at 323 Sayward Building, Victoria. The company's holdings consist of the *Silver Tip* group of five claims, situated just at timber-line in a rolling section of the upper Salmon River valley, in front of Mount Dilworth. The showings on the

property consist of a series of east-west veins, a north-south vein, the Morkill, May P.J., and one other vein which has not been named. The east-west veins have been named "Clegg Nos. 1, 2, and 3," from south to north.

Almost every mineralized showing on the property is along the hanging-wall side of one of the very numerous acidic dykes which cross this section of the country. The ore occurs chiefly in the dykes, as fairly solid but narrow lenses or as reticulating stringers. In some instances the sulphides are disseminated through the dykes and very frequently the hanging-wall rocks are pyritized for a few feet from the vein. The hanging-wall rock, in almost every instance, is of sedimentary origin and it is usually highly metamorphosed. They range from fine black carbonaceous argillites to conglomerates. The sheared and altered conglomerates and sandy shales are not easily distinguished from some of the bedded rocks of the underlying volcanic formation. In one or two instances the veins are not associated with dykes, as, for example, the lower end of north-south vein, and the east-west vein which lies on the west of the north-south vein. Also, in the south-eastern section of the property the hanging-wall of the May P.J. vein is crystalline rock and not a sedimentary rock.

Clegg No. 1 vein consists of a lens of high-grade silver-lead ore lying along the hanging-wall side of one of the numerous quartz-porphyry dykes which cross this section of the Salmon River valley. The high-grade section of the lens is up to 18 inches wide, and stringers penetrate into the dyke for another 2 or 3 feet. The strike is N. 70° W. (mag.) and the dip is 45° S. The lens is not very long, but the grade seems to be good. A lump of the heavy sulphides from the hanging-wall lens assayed: Gold, trace; silver, 83 oz. to the ton; lead, 23 per cent.; zinc, 19 per cent; and a few pieces from the slightly mineralized foot-wall section of the vein assayed: Gold, 0.02 oz. to the ton; silver, 59 oz. to the ton; lead, 0.2 per cent.; zinc, 2 per cent. Such values are worth tracing. The results of the second sample are a surprise, as the sulphide content of the sample was quite small, as indicated by the fact that the combined lead and zinc content amounts to only 2.2 per cent. A tunnel was driven under this last year and a crosscut driven to the vein from a point at about 36 feet from the portal. The vein in this crosscut is narrow, but the values are said to be fairly good. The main tunnel was continued another 21 feet and then turned to the left as a diagonal crosscut. This, I believe, picked up some mineralization, but nothing very strong.

Clegg No. 2 vein lies about 300 feet north of No. 1 vein. It follows a quartz-porphyry dyke and is from 1½ to 4 feet wide, but does not contain a high percentage of sulphides. A short tunnel was driven a year or two ago, but nothing has been done on it this year.

About 50 or 60 feet north of Clegg No. 2 vein is the third vein of the east-west series. It is only a small quartz vein along the contact of another quartz-porphyry dyke and the argillites.

One other east-west vein, not dignified with a special name, outcrops on the south side of a small hump west of the north-south vein and about on line with Clegg No. 2 vein. One cut has been made in this, but the full width of the vein has not been exposed. The 2½ feet of mineralization shown in the cut assayed: Gold, trace; silver, 21 oz. to the ton. The mineralization is in argillites and consists chiefly of pyrite. At the bottom of the cut a fine-grained dense green rock can be seen, which may be of tufaceous origin. A little more work could be done to advantage on this showing.

A number of trenches have been made along a ridge just west of the workings on the Clegg Nos. 1, 2, and 3 veins for the purpose of proving up the north-south vein, so called. I am not satisfied that these workings are on one mineralized zone, but there is so much wash on the surface that it is impossible to trace the showings between the cuts. At a point between Clegg Nos. 1 and 2 veins the north-south vein is about 18 inches wide and lies on the hanging-wall side of one of the quartz-porphyry dykes. The upper wall is argillites and contains seams and stringers of ore, and the dyke itself is cut by numerous quartz veinlets, but is not mineralized except for the upper 18 inches. A barren quartz vein outcrops on the strike of this vein to the south, and open-cuts along the strike to the north have found some mineralization. Most of the cuts were filled with gravel and could not be examined in detail. At each point, however, the ore seems to be associated with a quartz-porphyry dyke, but I am not sure that the same dyke has been followed in each instance. One new cut which has been made along the apparent strike of the vein, but not near a dyke, seemed to be quite barren. The mineralization appears

to be confined chiefly to the dykes, but in places pyrite has penetrated the argillites for some distance from the dyke, and such pyritized argillites are said to carry some values in silver.

East of the zone where the Clegg and north-south veins are being prospected, a vein striking north-east has been found in one of the acidic dykes. It is about 2 feet wide and consists of a foot of sparsely mineralized quartz on the hanging-wall and a foot of quartz with galena and a light-coloured sphalerite on the foot-wall side of the vein. A sample from the foot-wall section assayed: Gold, trace; silver, 8.8 oz. to the ton; lead, 1 per cent.; zinc, 10 per cent. This is known as the "Morkill vein."

One of the best surface exposures on the property is what is known as the "May P.J. vein," outcropping on a claim of the same name near the south-east corner of the property. The vein really belongs to the east-west system and is a fracture-zone, cemented with quartz, sphalerite, and galena, along the upper side of the most southerly of the acidic dykes. The whole vein zone is several feet wide and contains streaks of massive sulphides up to 1 foot wide, and 4 to 5 feet of it, in places, is fairly well mineralized. The west end of the vein has been faulted north along a fault that follows a small stream crossing the vein at right angles. It is possible that the hanging-wall of the vein is also a fault-plane. A small amount of work has been done on the vein west of the fault. I think the owners would be well advised to attempt to trace this section of the vein by open-cuts, or by a tunnel if the overburden is too deep, for the lens of ore on the opposite side of the fault looks fairly good. Moreover, this vein has an advantage over the others, in that the rocks a short distance above the vein are crystalline, and not the soft plastic argillites, which do not seem to be amenable to mineralization.

Last year a crosscut tunnel started towards the showings on the east side of the fault has been extended to 232 feet. This year it was continued another 23 feet to the vein and a drift was started to the right. The vein was encountered at a soft and broken spot and did not contain much mineralization, but I understand that the face of the short drift to the right contains a fair amount of sulphides.

**Silver Crest Mines, Ltd.**

This company was incorporated in October, 1919, with a capitalization of $500,000, divided into 2,000,000 shares of the par value of 25 cents each. The properties consist of the *Silver Hill* group of eleven Crown-granted claims, situated on the south-east slope of Mount Dilworth, at the head of the Salmon River valley, and adjoining the *Silver Tip* on the north. The *Saddle* property on Hastings arm is also being developed by this company.

The *Silver Crest* ground adjoins the *Silver Tip* and the types of the mineral occurrences are similar in every way. A series of north-westerly-striking acidic dykes, known as the "belt of dykes," cut through the argillites and are mineralized in places with silver-lead ore. Quite a long tunnel and drift have been driven under one showing which outcrops at about 4,000 feet elevation and 200 or 300 feet north of the camp, but nothing of importance was found. There are a number of open-cuts at various places, but since nothing has been done on the property since it was last described in the Annual Report for 1926 it is not necessary to describe the showings again.

**Lion.**

This group consists of five claims—*Lion Nos. 1*, *2*, and *3*, *Lion Fraction*, and *Tiger Fraction*—situated on the south-west slope of Mount Dilworth, adjoining the *Silver Tip* on the north-west. It is owned by W. Hobill, of Stewart, and partners. Last year an open-cut was made along a mineralized zone in one of the numerous acidic dykes which cross the south end of Mount Dilworth. The dyke strikes in an east-westerly direction, but the mineralized zone crosses it at a steep angle, striking N. 20° W. Since the mineralization apparently does not seem to extend into the argillites on either side of the dyke, the length of the vein is limited to the width of the dyke, which is about 20 feet. A deep cut was being made in the argillites along the strike of the vein to determine definitely whether or not the vein extended beyond the dyke. Although the cut was not completed at the time of my visit, nothing had been found in the cut up to that time and nothing favourable has been reported since.

A little west of the showing mentioned above some mineralization has been found on the south side of a similar dyke, but nothing had been done to open it up. Since the geology of the area covered by the *Lion* group is essentially the same as that on the *Silver Crest* and *Silver Tip* properties, it is quite possible that mineralized showings may be discovered on the *Lion* similar to those on the other two properties.

**Last Chance.** This group is situated on the west side of the Salmon River glacier, on the Alaska-British Columbia boundary-line. It was staked by Jean Bartholf and purchased by its present owner, H. A. Hallum, of Seattle. The showing consists of a small vein in the batholithic rocks, from 6 to 18 inches wide, and traceable for about 50 feet on the surface. It strikes north-west (mag.), dips 35° to the south, and consists of quartz, fragments of the wall-rock, and in places contains galena and a small amount of the common sulphides. A 100-foot cross-cut was being driven to the vein under contract, but had not reached the vein at the time of my visit. The tunnel contract gave a grubstake to a couple of good prospectors and was therefore partially justified.

**Outland Silver Bar Mines, Ltd.** This company was incorporated in 1920 with a capitalization of $500,000, divided into 500,000 shares. The registered office is in the Bank of Nova Scotia Building, Vancouver. The company's holdings consist of nine claims and a fraction, situated on the west side of the Salmon River glacier, just south of the West fork. A crew of thirteen men has been employed all summer under the supervision of F. C. Outland, one of the organizers of the company, and a considerable amount of work has been done at a very low unit cost.

Time did not permit more than a very hasty examination of two or three of the showings and consequently a complete description of the property cannot be given. The claims are situated in the north-westerly extension of the "belt of dykes" which crosses the *Silver Tip* and *Silver Crest* properties on the opposite side of the glacier, but the dykes here are narrower and more scattered than they are to the east and consequently have much wider zones of argillites between them. The ore is not confined to the hanging-wall side of the dykes, as it is farther east, but occurs as veins both in the argillites and in the dykes and as irregular replacements in the argillites.

On the hillside, a few hundred feet above the camp, a crosscut tunnel is being driven to intercept two parallel veins which had been located farther up the hill. One vein had been cut by the tunnel, but the second one had not been reached. The vein which had been cut is a shear-zone, varying from a few inches to a few feet in width, cutting both argillites and dykes. In the past a tunnel has been driven along this vein for a distance of 115 feet, and has shown it to be well mineralized with galena and some sphalerite for this distance. For the most part the sulphide zone is not wide, but it is said to carry high silver values. The strike is N. 20° E. and the dip is 43° to S.E.

Some distance west of this vein is a second vein, striking N. 10° E. and dipping at a steep angle to the south. It is a crushed zone in both argillites and dyke. In places the introduced vein-matter consists of quartz lenses up to 15 inches wide, while in other places it consists of stringers of quartz and galena distributed through a greater width of the fracture-zone. A tunnel has been faced off at one point, but otherwise nothing has been done to prospect the vein.

A short distance west of the camp and at about the same elevation is a patch of intensely metamorphosed and mineralized sediments outcropping in an area of perhaps 200 square feet. Lower down the bluffs are small patches of similar material. The larger zone is well mineralized with galena and variable amounts of pyrite, pyrrhotite, chalcopyrite, and sphalerite. A short tunnel driven immediately below the outcrop encountered such well-mineralized ground that a long crosscut was started about 250 feet lower in elevation. By September 18th this had been driven to a point beyond the vertical projection of the surface showings and workings had been driven for quite a distance right and left, but nothing had been found except a little very slightly mineralized ground. It is understood that something more encouraging had been found in these workings before the season was over. At present it is impossible to say whether or not the ore-zone is just a big knot with no appreciable depth or is a pipe-like body extending to considerable depth.

A small Rand compressor, steel-sharpener, and general camp supplies were taken in over the glacier in the early spring. The company is well financed and managed and the property will be opened up quickly if any quantity of commercial ore can be blocked out.

**St. Eugene.** This is a group of nine claims situated on the east side of August mountain, due north of the *Outland Silver Bar*, across the west branch of the Salmon River glacier. The claims in the group are as follows: *St. Eugene*, *St. Eugene Nos. 2* and *3*, *St. Eugene Extension*, *St. Eugene Fraction*, *Grey Copper*, *Grey Copper Fraction*, *Big Ben*, and *Big Ben No. 1*. They are owned by Maurice Petersen, Albert Johnston,

and partners, all of Stewart. The principal showings outcrop at about 5,000 feet elevation on the north side of the mountain overlooking Summit lake. The country-rock is dominantly greenstones of the volcanic series, but there are also small amounts of argillites and some fine-grained acidic crystalline rocks in the series cut by the veins.

Four parallel veins striking about north-south (mag.) and dipping steeply to the east have been discovered on this north side of the mountain. Three of these are within a zone about 50 feet wide and the fourth is about 150 feet to the east. Each of the group of three veins crosses from a reddish fine-grained siliceous rock to a narrow band of argillites and into greenstones. The part of each vein which is in the siliceous rock is much wider than any other exposed sections, widening out to as much as 5 feet, but unfortunately the greatest length of any of the lenses is about 60 feet, and one is no more than 20 feet long. Narrower sections of the veins are generally less than 1 foot wide. Crossing the cliffs several hundred feet above the exposed parts of the veins, and about on line with them, are three sharp gashes which might represent the southerly extension of the veins. It would be worth while to do a little prospecting in these zones.

Each of the veins is mineralized with quartz as the principal gangue mineral and galena as the principal sulphide. Tetrahedrite is conspicuous in places, while pyrite and sphalerite are quite common. Tetrahedrite in a lead-zinc vein in the Portland Canal camp is usually argentiferous, but the tetrahedrite in these veins does not seem to carry much silver. However, I took but one sample, and it may not be representative of the ore, although it is from a well-mineralized section of the vein. The sample was taken across a 2-foot section of the most easterly vein at a point where it is 5 feet wide. The other 3 feet, on the hanging-wall, was too much leached to be sampled. The sample assayed: Gold, trace; silver, 11.2 oz. to the ton; lead, 18 per cent.; zinc, 8 per cent.

The fourth vein, about 150 feet east of the group of three, is much more uniform in width, varying from 1 to 2 feet, and can be traced for quite a distance on the surface. Sphalerite is more abundant than in the other veins and chalcopyrite is a conspicuous mineral.

On the south side of August mountain a little work has been done on a narrow silicified and mineralized shear-zone in the volcanics, but the amount of sulphides in the lead does not give it a very promising appearance.

**Troy.** This property is situated on the west side of Mount Dilworth, just over the divide from the head of the Salmon River glacier. It consists of sixteen claims and fractions and is owned by Charley Lake and Neil McDonald, of Stewart. Nine of these claims, constituting the *Troy* group proper, were bonded to the Northland Mining Company, Limited, in 1925, but the company defaulted in its payment in October, 1926, and the claims reverted to the original owners. A full description of the work done by the Northland Mining Company in 1925 is given in the Annual Report for that year. About 700 feet of diamond-drilling was done the following summer. The camp is near the shores of Daisy lake, at an elevation of about 3,000 feet above sea-level, and it is one of the nicest little camps in the district.

Two of the principal veins, Nos. 1 and 2, outcrop in and along the walls of a steep little canyon which has been eroded along the contact of argillites and volcanic greenstones. Interbedded with the argillites near the contact are strong beds of sandstone and fine conglomerate, which are sometimes referred to as dykes. No. 1 vein outcrops in the floor of the canyon and could be seen at only one point, and even here the cut was filled with waste. A few nice pieces of lead ore showing some sphalerite, tetrahedrite, and chalcopyrite were lying on the dump. These are said to carry good values in silver.

The south end of No. 2 vein is exposed in a cut on the east side of the canyon, very close to the canyon wall. It is a shear-zone in argillites, striking N. 60° W. (mag.) and dipping steeply to the north-east. The vein zone, as exposed in the cut, consists chiefly of soft sheared graphitic argillites, but a zone 2 or 3 feet wide along the foot-wall is somewhat silicified and mineralized with bunches of lead and zinc sulphides. This has been traced southerly for several hundred feet by open-cuts, but in none of these was there as much showing as in the first cut mentioned. A tunnel was started towards this cut from the walls of the canyon, but it is said to have 40 feet to go before reaching the vein.

On Goat mountain, *No. 3* claim, straight up the hill from the cabin and at about 3,500 feet elevation, a vein has been traced by open-cuts for several hundred feet. It is in argillites and

is typical of such veins, consisting as it does of fragments of argillites, cemented by milky-white quartz and an iron carbonate and mineralized in places with bunches of galena and a clear light-coloured sphalerite. The vein is from 8 to 12 feet wide, but frequently it contains very little besides fractured and sheared argillites. The sulphide content was not high at any point examined.

**Pioneer.**

Two full groups of claims have been staked on the west side of Tide lake by William and Fred Jancowski and John Campbell, and named the *Pioneer Groups Nos. 1* and *2*. Tide lake is the third of the string of lakes situated on the north side of the Salmon-Nass River divide, in the Nass River drainage area. It can be reached from the *Big Missouri* property either by way of Salmon River valley past the *Hercules* and *Troy*, or up the Long Lake valley to a transverse valley which leads directly into Tide lake.

The first route follows the east side of the Salmon-Nass River valley all the way to the upper end of Tide lake and does not cross any glacier except a narrow tongue of the Mount Dilworth ice-cap, which runs down one of the narrow gulches, but the trail climbs to an elevation of something over 4,500 feet and is therefore in the snow until very late in the summer. It is also necessary to cross the stream which flows into the head of Tide lake from the transverse valley. At times this crossing is dangerous to a person on foot and nothing but the most temporary type of bridge can be put in, for the stream is flowing through a wide gravel-filled valley and is constantly changing its course.

The trail over the Long Lake route does not climb to more than about 3,500 feet elevation, but it crosses a mile of glacier in the transverse valley. Owing to the difficulty of maintaining the approaches to a glacier this route is not practical for a horse-trail. At present horses can be taken through to Tide lake via the Salmon River route, but the trail is in poor condition. It is expected that it will be improved next summer with assistance from the Department of Mines.

A small cabin has been constructed on the east side of Tide lake, but all the showings on the *Pioneer* groups are on the opposite side. A light sectional boat has been packed in by the Jancowski Bros. to be used as a ferry on the lake.

The showings consist of a number of silicified zones and shear-zones ranging from 1 to 150 feet or so in width. There are so many showings that a description of each will not be attempted, but there will be given only a general description of the mineralized area as a whole. The mineralizaion occurs in a series of volcanic rocks, some of which are well-bedded tuffs. Three major mineralized zones have been recognized and will be referred to as the "north," "intermediate," and "south" zones.

The south zone outcrops from the lake-level, at 2,200 feet, to at least 4,100 feet elevation, as a series of brightly stained and very conspicuous knobs of silicified and pyritized material. The bearing of the line of outcrops is about N. 80° E. (mag.) and the zone appears to dip northerly at a fairly steep angle. It is several scores of feet wide. One or two strong quartz ledges, slightly mineralized with pyrite and with traces of some of the other common sulphides, finger into the zone in a north-westerly direction. The amount of sulphide in any one part of the zone is not great, and it is chiefly present as disseminated material or in the numerous small quartz veinlets which cut the silicified zone. The only values which it might carry would be gold, unless lenses of more concentrated sulphide can be found. A sample from two large boulders blown out of one cut assayed but a trace of gold and 1 oz. silver to the ton.

The intermediate zone outcrops as a series of brightly stained bluffs along the lake-shore and up to about 2,700 feet elevation. The showings in this consist of a number of silicified shear-zones which have been formed across the crest and along the limbs of a south-easterly-plunging anticline in well-bedded tuffs. The shear-zones vary from 2 to 12 or more feet in width. In general those on the south side of the structure strike about N. 75° E. (mag.), while those on the crest strike east-west and those on the north side strike N. 70° W. They all dip southerly at a steep angle. Some of these zones contain a great deal of pyrite and are cut by narrow black stringers, which seem to consist of sphalerite, a little galena, and possibly silver sulphides. A 2-foot sample across a face containing two or three of these stringers assayed 0.16 oz. gold and 14.2 oz. silver to the ton. Two other samples taken from the silicified and pyritized ground, and not containing the dark stringers, assayed only traces of gold and silver.

Another big rusty knob outcropping along the lake-shore just south of the one described above contains a number of shear-zones essentially the same as those just described, and should

really be included in the intermediate zone of mineralization. Practically nothing has been done, however, on this knob and it was not examined in detail.

Very little is known about the north zone. The lower end of it is a huge siliceous zone immediately above the summer camping-grounds, about 500 feet above the lake. It is said to have been traced in a north-westerly direction, but I made no attempt to follow it, as no work had been done on it, except at the lower end, where a couple of shots had broken off some large boulders. The sample which I took from these assayed only a trace of gold and silver.

Although many of the samples were very disappointing, I think the owners should do at least another summer's work on the showing and open up more of the shear-zones in the intermediate zone. They are already aware of the fact that the dark streaks indicate possible values in silver and gold and can judge whether or not they are opening up a possible ore-zone. Any zone which contains a fair proportion of such streaks should be opened at regular intervals and carefully sampled. There is so much mineralization on the claims that it will require more than one summer to even prospect them thoroughly, but one summer's work will help to determine the policy for future summers.

**Silver.** The *Silver* group of four claims—*Silverton Nos. 2* and *3*, *Silver Fraction*, and *Silver Fraction No. 1*—is situated on the west side of Tide lake, south of the *Pioneer* groups, and is owned by J. R. Jancowski, of Vancouver, and partners. Several showings have been found on the property, but none of them has been prospected to any extent. A calcite vein striking N. 70° W. (mag.) and dipping 65° S. has been found in the greenstones, about 250 feet above the lake-shore, on the north side of a small creek. It is very sparsely mineralized and has not been opened with cuts. About 200 feet higher, on the opposite side of the creek, a short lens of silver-lead ore has been discovered and stripped along the surface. It is a very short vein and no more than 2½ feet wide at the widest place. A sample of massive sulphides taken to give an indication of the relative amounts of precious metals contained in the ore assayed: Gold, 0.30 oz. to the ton; silver, 148 oz. to the ton; lead, 30 per cent.; zinc, 4 per cent.

About 350 feet higher up the mountain and in the same creek-bed a shot has exposed a 3½-foot vein, well mineralized with sphalerite and pyrite. About 400 feet in elevation above this again, one can find a great deal of float at the foot of a talus-slope. Several blocks of pyrite were seen, as well as blocks containing a considerable amount of sphalerite and some galena. Evidently this material comes from the cliffs above, but very little attempt has been made to locate the lead from which it has been thrown, as the owners have been busy prospecting other sections of their claims. A very dense fog prevented our exploring the bluffs at the time of my visit. The fog also prevented my examining other leads higher up the mountain. The *Silver* group seems to be well worth prospecting.

**Silverton.** This group adjoins the *Silver* group on the south and is owned by Mr. Boer, of Hyder, and partners. The owner was preparing to leave the day I visited his camp and I was unable to see the showings. While examining the *Silver* group with J. R. Jancowski I was informed that some of the mineralized zones extend from the *Silver* to the *Silverton* group, and that this is true especially of the zone which produced the iron and zinc float.

## STIKINE AND LIARD MINING DIVISIONS.

These two Divisions comprise the northern section of the Province, except the Atlin Division, and have an area of about 70,000 square miles.

The Stikine Division is the drainage area of the Stikine river, which empties into the Pacific ocean near Wrangell, Alaska. The Liard Division is the drainage area of the Liard river, which flows into the Mackenzie river at Fort Simpson, and therefore lies on the Arctic slope. Both these areas are reached by boat up the Stikine river from Wrangell to Telegraph Creek, the head of navigation. From Telegraph Creek to Dease lake a good truck-road has been completed and the distance can be made in a few hours. From Dease lake is a waterway to the north and pack-trails to the interior.

These Divisions were not visited this year, so that nothing can be added to the descriptions of the district already in print. The most recent of these, aside from the Annual Reports, are reports by W. A. Johnston and F. A. Kerr on the gold placers and bed-rock geology of the Dease Lake area published in the Geological Survey of Canada Summary Report, Part A, 1925. In the same publication there is an account of geological explorations between Atlin and Tele-

graph Creek by W. E. Cockfield. The placer occurrences and possibilities are fully dealt with by Dr. Johnson and nothing has developed recently to alter his general descriptions or conclusions. Dr. Kerr is continuing his investigation of the district, having examined a considerable stretch along the eastern contact of the Coast Range batholith during the past summer. Although his final report is not available, he has published a brief article in the January number of the C.I.M.M. Bulletin, 1928, which is of decided interest.

It has long been recognized that the eastern contact of the Coast Range batholith is the most favourable place for prospecting in the north-west section of the Province, but with the exception of a few points, such as along the Skeena river, or at the head of Portland canal and Alice arm, this contact is very difficultly accessible. The Stikine river crosses this contact and offers the transportation facilities which are so important to the development of any mining district. Referring to the possibilities of this district, Dr. Kerr writes, in the last article referred to:—

"There has been some desultory hard-rock prospecting which has resulted in the discoveries just mentioned. However, the greater part of the area has probably been neglected. Certainly none of it was subjected to intensive prospecting, such as was carried on in the Portland Canal or Atlin districts, even before the development of their great mines.

"The country is new and would seem to have great possibilities, and it is accessible, easily accessible. Stikine river affords good transportation facilities. Some of the larger tributaries, the Chutatine (or Clearwater) and Iskut rivers, are navigable for considerable distances by small boats. There are many wide, glaciated valleys, which, because of their slight gradients, afford excellent locations for roads and railways, giving access to the country adjacent to the navigable rivers.

"The contact of the composite batholith crosses the Chutatine (or Clearwater) river at about 25 miles from the Stikine, and tends toward Stikine, which it reaches 6 miles below the mouth of the Chutatine. It is close to the Stikine on one side or the other as far as the Scud. Beyond this it trends away from the main river and crosses the Iskut about 25 miles above the Stikine. Thus the greater part of the contact-zone is contiguous to the Stikine and its larger tributaries for nearly 75 miles. That is, there are at least 1,000 square miles of reasonably accessible country practically unprospected, in which geological conditions seem to be favourable for the occurrence of mineral-deposits."

Surely this area is worth prospecting. A weekly boat service is maintained by the Barrington Transportation Company between Wrangell, Alaska, and Telegraph Creek.

This year a Keystone drill was being worked on the Chutatine river by the Barrington Transportation Company. Although nothing spectacular was found in the drilling, the company has taken out five new leases and will continue the drilling programme next year.

On Gold Pan creek *Discovery* claim was worked by Grandy & Cambron and about 150 oz. was recovered. It is the intention of the owners to install a small hydraulic plant before doing any more mining. Above *Discovery*, Moody & Vickery took out about 80 oz. before they were driven out by water. Vickery is staying in for the winter and will try to reach bed-rock.

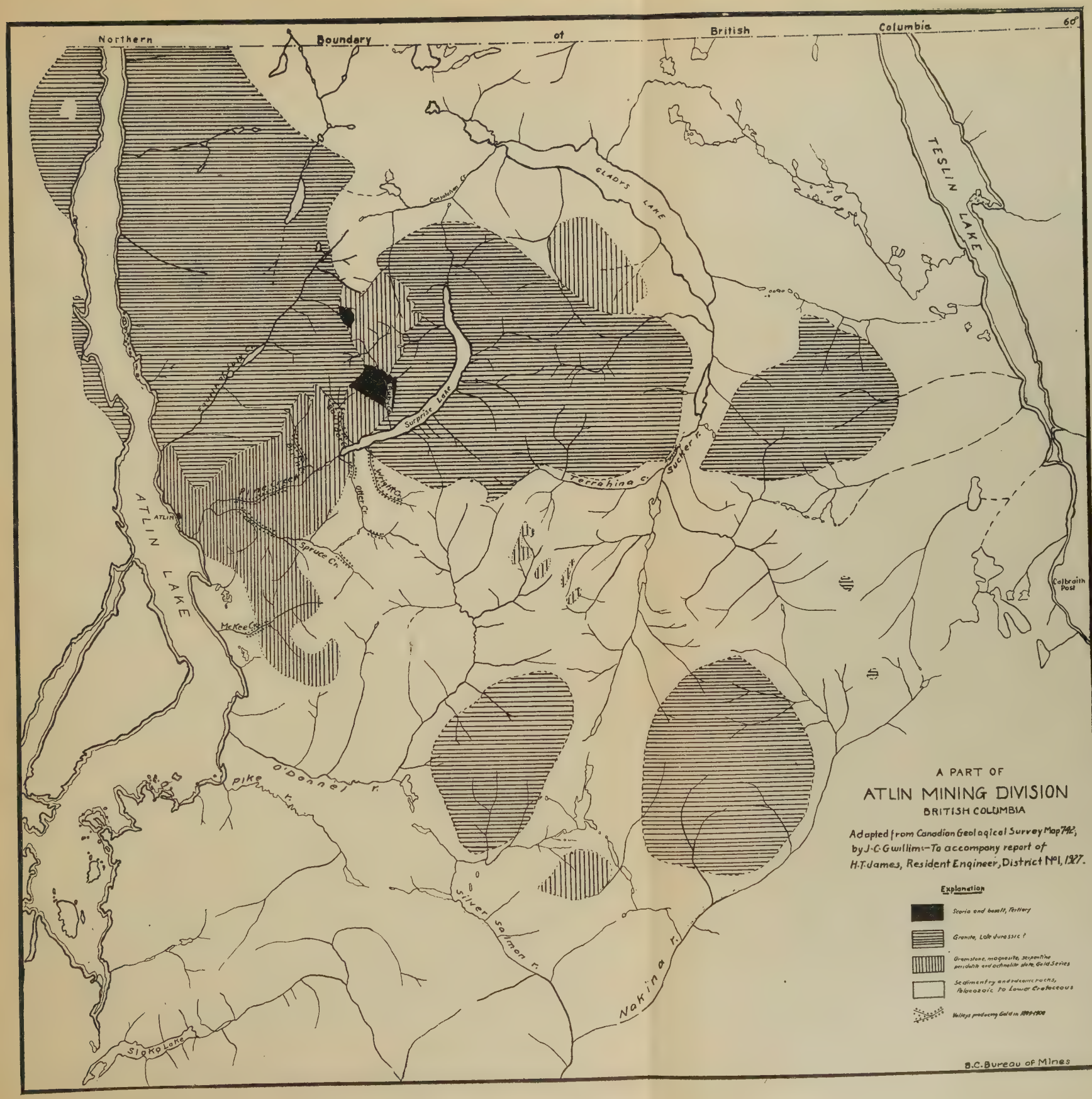
On Palmer creek Horsfield & Hall built cabins, took in two years' supplies, and did a good deal of preparatory work.

Dease creek had a fairly active season in development, but did not produce much gold. The Joy Mines Company, which took over leases 120 and 121 from H. Cole, built about 4 miles of wagon-road from Dease lake to the leases, also constructed camp buildings, warehouses, logged and cut about 60,000 feet of lumber for flumes, and cleared a right-of-way for the ditch. On lease 103 McKay & Bryant with four men spent the season in widening their ditch and assembling pipe-line. The Dease Creek Mines Corporation on leases 136 to 142 finished its ditch and installed pipe. It is probable that the ditch will have to be flumed, for it is built along a side-hill in glacial material and will not stay in. The Dickenson Mining Company was inactive and it is assumed that its holdings will be taken over by the Dease Creek Mines Corporation.

On Mosquito creek the Gibson leases were well represented with eight men, who built 2,000 feet of flume, cut 150 feet of bed-rock flume through a reef, and also widened and improved about 4 miles of their road.

Nothing was done on Thibert creek but assessment-work.

The production of placer gold from the Stikine and Liard Divisions for 1927 was $6,205.


Northern Boundary of British Columbia
60°
GLADYS LAKE
TESLIN LAKE
Consolation Cr.
Surprise Lake
Surprise Cr.
Terrahina Cr.
Sucker R.
Wright Cr.
Otter Cr.
Pine Creek
ATLIN
ATLIN LAKE
Spruce Cr.
McKee Cr.
Calbraith Post
Pike R.
O'Donnel R.
Silver Salmon R.
Nakina R.
Sloko Lake
A PART OF
ATLIN MINING DIVISION
BRITISH COLUMBIA
Adapted from Canadian Geological Survey Map 742,
by J.C. Gwillim — To accompany report of
H.T. James, Resident Engineer, District No. 1, 1927.
Explanation
Scoria and basalt, Tertiary
Granite, Late Jurassic ?
Greenstone, magnesite, serpentine peridotite and ochmolite slate, Gold Series
Sedimentary and volcanic rocks, Palaeozoic to Lower Cretaceous
Valleys producing Gold in 1899-1926
B.C. Bureau of Mines

## ATLIN MINING DIVISION.

The Atlin Mining Division includes all the north-western section of the Province which does not fall within the drainage areas of the Stikine or Liard rivers. For the purposes of this report it is divided into two sections, known as the Rainy Hollow and the Atlin Lake sections.

The Rainy Hollow section may be taken to include the small triangular area which is the extreme north-west corner of the Province, almost cut off from the remainder of the Province by the big embayment in the Alaska boundary around the head of Lynn canal. The only mining activity there has ever been in the section is up the Klehini river, around a spot near the International boundary, which has been known since the early days as "Rainy Hollow."

The point of entry to the district is Haines, Alaska, a small town on the west side of Lynn canal, about 15 miles below Skagway. From here to the International boundary, a distance of about 43 miles, the Alaska Road Commission is building an exceilent automobile-road. Although the new road is not yet completed, cars can be driven quite easily through to Pleasant Camp, B.C., at the boundary, affording an excellent means of access to a section which seems to be fairly well mineralized. A number of years ago, when the district was more active, a wagon-road was built from Pleasant Camp up the Klehini for a distance of about 10 miles to the spot which is known as Rainy Hollow. In this general district there are properties which would be very attractive if situated nearer transportation, and which may become important now that the transportation difficulties are being remedied. Only a few of these properties could be examined this year, and then only under adverse weather conditions. A number of claims have been located in the district, but most of them are relocations of abandoned claims. The most important work which has been done this year is the prospecting of the *Stampede* group by Stenbraten & Bunting. Only a small arount of work has been done on any of the other showings in the Rainy Hollow section.

The Atlin Lake section, constituting the remainder of the Atlin Division, has had a fairly successful year and would seem to have prospects for many successful years ahead of it. This optimistic statement of the future possibilities of the camp refer especially to the placer-mining activities, and is based on one very brief and superficial examination of the camp. Consequently it may be too optimistic, but it seemed to me that the Atlin camp has distinct possibilities. Some of the possibilites which seem to exist will be outlined below.

A geological investigation of the Atlin camp was made in 1899 and 1900 by J. C. Gwillim for the Geological Survey of Canada, and the results of his investigation were published in Part B of the Annual Report for 1899, Vol. XII. This was immediately after Atlin became known as a producing placer camp. Other officers of the Geological Survey have been in the district since then, but they have been concerned with lode-mining possibilities and not with placer. Accompanying Gwillim's report is a geological map of the territory between Taku arm of Tagish lake and the lower end of Teslin lake. An adaptation of a part of this map is reproduced here in order to facilitate discussion of certain features. It will be observed that nearly all the gold has come from streams which flow into Atlin lake from the east, and most of it has come from Pine creek and its tributaries. This is just as true to-day as it was when the map was made twenty-seven years ago, except that some gold has been found in O'Donnel river. The bed-rock under most of the gold-bearing streams is a series of peridotites, serpentines, and actinolitic slates which Gwillim has called the "Gold series." These are underlain, stratigraphically, by a great thickness of sedimentary rocks of all descriptions, and all, including the Gold series, are intruded by several granitic stocks. It might seem at first glance that the distribution of the placer gold is dependent upon the distribution of the Gold series, and that the only favourable creeks are those flowing over the series or through areas from which this series has been eroded by the present streams. It is more probable, however, that the association of gold to the basic rocks is a coincidence rather than anything else. From our present knowledge as to the origin of placer gold, and the veins from which it is derived, it is safe to assume that the favourable streams are those which flow through the contact-zones surrounding each of the granitic stocks, for such stocks are usually surrounded by zones of variable width, in which there are many veins and bodies of mineralized rock, from which the placers are produced. Pine creek, together with its tributaries, is therefore a good placer creek, because it is near the largest of the five stocks shown on the map, and not because it flows through a series of peridotites and serpentines. This interpretation is supported by the fact that good gold has been found at several points

quite a distance from the Gold series (so called), such as in Wright creek, in the upper parts of Otter and Spruce creeks, and in O'Donnel river.

If this interpretation be correct, we may well ask why a number of the other streams in the district have not produced placer gold. Why, for example, has O'Donnel river not been a big producer, especially its upper tributaries, and, likewise, what about the possibilities of the Terrahina and other tributaries of the Sucker river, which cross the contact-zone of some of the other plugs; and also Consolation creek and others flowing into Gladys lake from the west?

I am told that the streams in the O'Donnel River section are deep streams and difficult for an individual miner to prospect, but that does not necessarily mean that they may not be profitable streams. Many of these streams may have had good placer deposits before the ice age, but glaciation after may have eroded the deposits and scattered the gold. Until the extent of glaciation in these streams has been determined it will be impossible to say whether or not they are worth exploring. A covering of glacial gravel, even many feet deep, does not mean that the bottom gravels and placer have been disturbed to any extent, for in McKee creek well-bedded gravels immediately under the glacial material are hardly disturbed (*see* accompanying photograph). It is necessary, therefore, to determine, besides the areal extent of glaciation, also if possible the intensity, not an easy thing for an amateur. In general, streams which head in glacial cirques will not contain placer gold for some considerable distance below the cirques. The possibilities, or lack of possibilities, of many streams in the district could be determined more definitely if the district were examined by a geologist, particularly by one trained in placer-work.

One of the numerous streams whose possibilities we have just questioned is to be tested on an extensive scale next season, it is said. If the results prove satisfactory a renewed interest should be taken in many other creeks in the district. The creek referred to is Consolation creek, flowing into the north end of Gladys lake.

There is reason to feel encouraged about the placer-mining in Atlin, aside from the remote possibilities of new creeks being brought in. After having had a considerable amount of preparatory work done on it, McKee creek should produce steadily for some time to come. Spruce creek is paying well at many points, and Ruby creek is developed to a point where production should be steady. A. Sostad's work on Pine creek may be expected to produce results very soon, and by the end of another season Boulder creek should be about ready to produce.

The northern part of the Atlin section will probably be very active for next season at least, as the result of a reported strike on Squaw creek. Concerning this new discovery, C. L. Munroe, Gold Commissioner at Atlin, writes as follows:—

"Considerable excitement has been stirred up in and around White Horse over a placer strike made by some Indian on Squaw creek, which is about 170 miles south-west of White Horse, 12 miles south of Dalton Post, and just over the boundary-line in British Columbia. Eleven ounces of coarse gold were brought into White Horse by the Indians, who reported that it had been washed out by two men in two days. A small stampede followed and over fifty claims were located and recorded in this office (Atlin). Cold and stormy weather set in before any actual work could be done, and it is not likely that anything more will be accomplished until the snow goes, which will be along in May or June."

While placer-mining in the Atlin section has been stressed, the lode-mining situation is not discouraging. Unfortunately, the *Engineer* mine has closed down for the winter again, but, to compensate this, J. M. Ruffner has been working a crew of about twenty men at the Atlin Silver-Lead mines since his return to the district in October. With a crew of this size on the ground the value of the property should be determined before long.

### Rainy Hollow Section.

**Maid of Erin.** This property is situated on Mineral mountain, about 58 miles from Haines, a small town on Lynn canal about 15 miles south of Skagway. It is owned by Richard Kennedy, of Haines, Alaska. The Alaska Road Commission is building an excellent auto-road from Haines to the International boundary, a distance of about 43 miles, and there is an old road from the boundary to the camp, but since nothing has been done in this section of the country for a number of years it has not been kept in repair.

Quite a bit of work was done on the property in 1920 and 1921 by Robert Wiley, of Seattle, but since then it has remained idle. The ore occurs as typical contact-metamorphic deposits in

limestones, probably of Palæozoic age. Three separate veins have been located on the hillside, and I understand that other deposits have been found a few hundred feet below the camp along the granite-limestone contact. Two of the three veins examined are close together and outcrop a short distance above the camp, while the third outcrops below the trail and south of the camp. They are all about parallel, striking N. 65° W. and dipping north-easterly into the hill at a flat angle.

It is probable that they represent replacements of favourable beds in the limestone series and will follow these beds more or less faithfully along their dip. If this is correct, the ore-zones may be found to flatten out and then dip the other way, as they are followed into the hill, for interbedded argillites, a short distance up the hill, have a south-westerly dip.

The hanging-wall of each zone is a massive band of lime silicates, such as garnet, epidote, and tremolite, while the foot-wall is recrystallized limestone, or marble. Where sulphides are present they are concentrated between the marble and silicate bands, but they also penetrate the silicate hanging-wall for variable distances. Bornite is the principal primary metallic mineral, although chalcopyrite and magnetite are conspicuous in places, and silver is an important constituent of the ore. Chalcocite is plentiful near the surface as a secondary mineral after the bornite.

The well-mineralized section of the main vein is up to 5 feet wide. Some beautiful ore has been broken from the surface of the vein and taken from an incline shaft driven down the vein. Only a part of this shaft could be examined, as the remainder was filled with water. The following is G. Clothier's description of the underground workings, as contained in the 1921 Annual Report:—

"An incline shaft has been sunk on the main vein, following the limestone foot-wall, to a depth of 160 feet (in the middle of July), exposing from 1 to 5 feet of solid bornite and chalcocite all the way down. I understand that the shaft was continued to over 200 feet depth with good ore all the way, though rather broken up at the bottom. Drifts are being run from the bottom of the shaft and are opening up a fine shoot of ore."

The depths given are slope distances. It would seem that there might be a chance of opening up a small tonnage of good ore, but the stopes would be too flat to permit a natural flow of rock and mining would therefore be a little more expensive than usual. Any concentrates made, however, should be high grade and reduce the shipping cost, for the principal sulphide is bornite, containing nearly twice as much copper as chalcopyrite, and there is about 1½ oz. silver to the unit of copper. Concentrates should run around 40 to 50 per cent. copper and 60 to 70 oz. silver to the ton. This would be an attractive little property if it were more favourably situated.

**Mother Lode.** This group of three claims—*Mother Lode, Sunker Hill,* and *California*—adjoins the *Victoria* property and is owned by J. J. Kennedy, of Haines, Alaska. The one showing on the property is a well-defined shear-zone, about 6 feet wide, outcropping along the steep walls of Jarvis creek, about 400 or 500 feet south of the massive lead vein on the *Victoria.* The zone is about on line with the *Victoria* vein and, being about parallel to it, may be a part of the same vein. The shear-zone on the *Mother Lode* ground contains a fair amount of iron, lead, and zinc sulphides.

**Victoria.** This property, owned by Richard Kennedy, of Haines, Alaska, is situated on the wagon-road a mile or two south of the *Maid of Erin.* The showing on the property consists of a lens of massive galena and sphalerite in limestone. The lens is about 15 feet wide in one cut and about 10 feet wide in another cut 25 feet south. Nothing has been done to follow the vein farther in either direction, although a few natural exposures at the north end of the vein would seem to indicate it does not go far in that direction. A tunnel was started towards the vein and driven 55 feet, but not far enough to reach it.

An 8-foot sample across a part of the narrower cut assayed: Gold, 0.02 oz. to the ton; silver, 6.2 oz. to the ton; lead, 28.6 per cent.; zinc, 24 per cent. This would likewise make an attractive prospect if it were nearer cheap transportation.

**Stampede.** This group was staked in 1925 by J. O. Stenbraten, better known as "Stampede John," on the north side of the glacier and stream which flows into the Klehini river at Pleasant Camp, B.C. This camp is an old Royal North West Mounted Police post situated just on the British Columbia side of the International boundary, about 43 miles from Haines, Alaska. The Alaska Road Commission is completing a very excellent automobile-road from Haines to the boundary and a car can be taken through to the camp very easily

at the present time. The showings are about 4 miles in a direct line from the end of the road and probably 6 miles by trail. William Bunting, of Hyder, Alaska, is interested in the claim with J. O. Stenbraten. The camp and showings are at an elevation of about 4,400 feet above sea-level.

The upper part of the mountain on which the claims are situated is a dioritic rock, intrusive into a thick series of limestones which are presumably of Palæozoic age. The limestones lie south of the intrusive rocks, outcropping from the glacier at probably 2,500 feet elevation to about 4,300 feet elevation. The principal showing is a quartz vein in the diorite, striking east-west (mag.) and nearly parallel to the contact and 200 or 300 feet north of it. The vein dips north into the diorite. Since locating the property the owners have done a great deal of stripping and have traced the vein by a series of open-cuts for a distance of about 3,000 feet west of the International boundary and claim to have located another 1,500 feet west of this again, on the far side of a rubble-filled draw. The easterly 1,500 feet of the vein is very narrow and apparently of no great importance, for the values are essentially low grade. For the next claim-length west, however, the vein is more promising in appearance. At two shafts, where the most work has been done, the vein, or lead, is found to consist of three distinct quartz veins separated by a few inches to a foot and a half of slightly pyritized diorite. At these places the total width of the lead, including the mineralized diorite, is from 5 to 7 feet or more, the individual quartz veins varying from 1 to 4 feet. Since the other cuts were narrow and had exposed only one vein it was suggested that wider cuts might disclose other veins. Since the examination one of these cuts was widened and the other two parallel veins were located, which are said to be very similar to those previously exposed in the shafts.

Two competent engineers have sampled the property. Their samples assayed from $7 to $8 a ton in gold, but I do not know how much oxidized material was included in the samples to give this average. My vein samples would indicate a lower average value, but they need not represent a true average of the vein, for only four samples were taken in a length of 1,500 feet. The veins consist of white quartz mineralized with a very small amount of pyrite. Free gold is conspicuous in some of the oxidized croppings. The four samples taken are as follows:—

No. 1. Most westerly cut, showing a little copper and iron stain; width, 2 feet 7 inches; values, 0.10 oz. gold and 0.21 oz. silver to the ton. Leached vugs and sulphides were avoided in sampling.

No. 2. About 800 feet east, clear white quartz, with no sulphides or iron-stain; width, 1 foot 6 inches; values, 0.10 oz. gold and 0.20 oz. silver to the ton.

No. 3. At westerly shaft; sample was taken across hanging-wall vein at the bottom of the shaft where there are no leached vugs or sulphides; width, 3 feet 2 inches; values, 0.30 oz. gold and 0.30 oz. silver to the ton. The other two veins are 2 feet and 1 foot wide and were not sampled.

No. 4. Sample taken across two foot-wall veins 12 feet below the surface in easterly shaft; width, 3 feet 9 inches, including 7 inches of mineralized diorite between the veins. The veins are slightly rusty, but there are no leached vugs or sulphides. Values, 0.20 oz. gold and 0.2 oz. silver to the ton.

Although these values are not high, I think they are distinctly encouraging in a vein of this length. It is quite possible that higher-grade ore-shoots might be found with more surface work. If sufficient good ore could be discovered to warrant installing machinery there is a possibility of developing a considerable tonnage of low-grade material which might be mined at a profit. The search for higher-grade ore-shoots by surface cuts should be continued. A number of small quartz veins have been found in the limestones below the diorite contact.

### Atlin Lake Section.

**Engineer Gold Mines, Ltd.**

This company was incorporated in the State of Delaware with a capitalization of $1,000,000, and in May, 1924, was registered in British Columbia. The properties consist of the *Engineer* group of seven claims, situated on the east side of Tagish lake, near the south end. The main part of the mine was closed last winter while a shaft was being sunk on one of the big quartz hubs, or circular pipes, from which some of the veins seem to radiate. Stoping and underground exploration were resumed in the spring and continued till the early fall, when the mine was again closed down for the winter. It is expected that it will be reopened in the spring, as fairly encouraging results were said to have been optained from development-work late this last summer (1927).

Hydraulic Mining in Quesnel M.D.

George Mine Camp, Portland Canal M.D.

Quesnel River.

Germansen Lake.

When the property was examined about the end of August the company was busily engaged in developing the "E" vein on the seventh and eighth levels and the "Double Decker" vein on the eighth level, and were also mining and milling about 50 tons of ore a day. Most of the production in the past has come from the E vein and a small amount has been broken in the Double Decker, but none of the other numerous veins have been productive, even although "showings" of gold have been found in many of them.

The general setting of the *Engineer* deposits has been well and briefly described by D. D. Cairnes, in Memoir 37 of the Geological Survey of Canada, as follows:—

"The geological formations at and in the vicinity of the *Engineer* mine are predominantly Jura-Cretaceous, finely textured greywackes, shales, and slates of the Laberge series, which range from brownish and dark greenish to almost black in colour and are probably, to a considerable extent, pyroclastic in nature. These beds have been invaded by dykes of andesite and granite porphyry, and are in places faulted, folded, and considerably distorted, but have a general strike of about N. 63° W. and dip to the north-east at an average angle of about 35°. Most of the ore-bodies occur in the dark to almost black, finely textured, Laberge members.

"Two large, central, compound veins, or hubs, consisting of quartz and intercalated and brecciated shale, slate, and altered rock occur, from which several veins radiate, most of them in north-westerly and south-easterly directions. In addition, a number of veins have been discovered which are not as yet traceable into any central quartz area.

"Hub A is at least 200 feet wide at its widest point, and is over 300 feet in length. . . . The mass consists largely of quartz, but also contains a large proportion of intercalated bands of shale and slate. . . . Hub B is very similar in appearance to hub A, contains a large amount of intercalated and brecciated shale and slate, and is in reality a compound vein. It is at least 270 feet wide, as this much is exposed to view, but neither wall was found."

The ore does not occur in the hubs, but in some of the radiating veins, and the E and Double Decker are so far the only ones which have proved commercial. Since exploration was being done on these two only, they are the only two which I have seen. They consist of very steeply dipping north-south fissures, filled with fragments of argillites, cemented with quartz and calcite, dominantly, and a few uncommon gangue minerals. Bands of light apple-green material are fairly plentiful on the lower levels and appear to be a very fine-grained aggregate of quartz and some micaceous mineral. Other materials resembling one of the fibrous zeolites have also been found. Vugs lined with calcite, quartz, or the green material are very common and are quite large, measuring as much a 1 by 2 feet in cross-sections and of even greater length. Banding and comb structure is also common, both around included fragments of wall-rock and along the walls of the vein. The Double Decker vein on the eighth level consists of rosettes of radiating quartz crystals projecting for about 4 inches from either wall towards the centre of the vein, leaving a long open space down the centre of the vein.

Metallic minerals are not very plentiful. Pyrite is the most common sulphide and can usually be found as small crystals lining the quartz vugs. Chalcopyrite is the only other sulphide I observed, and it was likewise in a vug. Large reniform masses of allemontite (antimony arsenide) were commonly found in the upper levels, but are rarely found on the lower levels. The economically important mineral is gold, occurring as a very light-coloured native gold, which is almost invariably associated with a very dark-green chloritic mineral which is said to have been identified as maraposite, a chrome mica. It seems to be much too dark coloured for maraposite, but specimens were not secured for identification. The peculiar and distinctive feature about the gold occurrence in the *Engineer* is that this dark material, spotted with gold, occurs in the vein as fragments surrounded by the quartz and calcite in the same way that the fragments of wall-rock occur in the vein. These fragments may be of any dimension, from the size of a pin-head to a sheet a few inches thick by several feet in diameter. Unless these fragments (or "shows," as they are called) can be seen the vein is very low grade. The fragments themselves run all the way from $20,000 to several times that amount in gold and silver to the ton. According to Mr. Hodson, the superintendent, some gold free from the dark-green mineral has been found near the surface, but the gold is confined to a sharply defined area resembling a fragment, and ghosts of the green mineral can usually be seen, suggesting that this mineral has been replaced by the quartz in the upper levels of the mine.

It would seem that there has been two distinct periods of mineralization. The first period apparently produced a narrow but very high-grade vein of gold, associated with the dark-green

mineral. Movement then reopened the vein, fractured the vein-matter and wall-rock, and these fragments were then cemented in with the later mineralization of quartz and calcite. Although I have not seen the allemontite, except in a few specimens, it would seem that this mineral belongs to the first period of mineralization. Most of the fragments of country-rock and gold ore occur along the foot-wall of the veins. The veins are very steep and roll a little, so that one wall may be the foot-wall for a short distance, then the other wall will become the foot-wall, but the fragments are most numerous on the foot-wall, no matter whether it is the east or west wall. This fact has been recognized by the engineering staff for some time and governs their search for "shows" of ore in the working-faces. The "shows" most certainly seem to be real fragments in a vein and to represent a vein which existed before the present quartz-calcite veins were formed.

If it is true that there has been two periods of mineralization, separated by a period of movement, during which the fissures were reopened, it is possible that the new vein may not always follow the old vein throughout its entire length. Since the new vein mineralization does not carry gold, such sections of this vein as did not follow the old vein would be barren, and the sections of the old vein, opposite these sections of the new vein, would be a narrow but very high-grade vein. Since these possibilities apparently do exist great care should be taken to see that the original fracture and vein is not left in the walls of the workings.

**Happy Sullivan.**

This group, consisting of three claims—*Crackerjack*, *Gold Hill*, and *Gold Bullion*—is situated on Sheep creek, a short distance below the *Engineer*. The group is owned by Sands & Pelton, of Atlin, and has been developed this summer by the Consolidated Mining and Smelting Company. The showing is a quartz vein in a series of arkosic sandstones and shales and is said to be the continuation of the Mickey vein on the *Engineer* ground. At one of the lower exposures, where a short tunnel has been driven along the vein, it is about 10 feet wide and consists of quartz and silicified country-rock. Several cuts have been put in this summer above the tunnel at intervals for several hundred feet along the strike of the vein.

The lower cuts expose a vein of quartz and silicified country-rock of fairly definite width, but cuts farther up the hill expose only stringers of quartz and ribs of silicified ground scattered through a fairly wide zone. In places pyrite is conspicuous, but other sulphides are completely lacking.

**Atlin Silver-Lead Mines.**

This property is a trusteeship which is under the management of J. M. Ruffner, of Atlin. It consists of some twenty-four claims and fractions, situated on Vaughn mountain, about 10 miles up Fourth of July creek and 14 miles from Atlin. The showings and workings were not examined in detail this summer, as time was short and there was no one on the property familiar with all the workings. The property was practically closed down, as J. M. Ruffner was in the East arranging for the financing of the development-work. Since his return in late October a crew of twenty men has been employed. This would seem to indicate that the company is well financed, and has outlined an extensive development programme, which it is hoped will establish the property as a mine.

A detailed description of the veins is to be found in previous Annual Reports and in the Geological Survey of Canada Summary Report for 1925, Part A, page 17. At least three veins have been discovered and each of these occurs in a sheared and fractured basic dyke cutting a granitic stock. No. 2 vein has been traced for 5,000 feet and No. 4 vein for 2,000 feet on the surface. No. 3 vein, lying between the two, has been picked up at one or two points. The veins have not been traced continuously for these lengths, but outcrops line up so well that continuity is assumed in the intervening stretches.

In 1926, after an option on the property had been dropped by the Federal Mining and Smelting Company, a little crosscutting and drifting on the lower level, No. 2 vein, resulted in the discovery of an ore-shoot about 225 feet long and 12 to 15 feet wide. A winze was sunk on this to a depth of 50 feet and the ore-body crosscut from the bottom of the winze. The ore-shoot is by no means massive ore. There is a foot or two of fairly massive lead and zinc sulphides along the foot-wall and numerous stringers of these sulphides along a hanging-wall zone. The whole would probably make a milling-ore. During the summer a tunnel was being driven along the vein towards the ore-shoot at a lower level.

The sulphides consist of galena, sphalerite, pyrite, chalcopyrite, arsenopyrite, and ruby silver. This last mineral is at least much later than the other sulphides, occurring as narrow veinlets

in them, and is probably secondary, in which case the silver content of the ore will decrease appreciably with depth.

PLACER-MINING.

I am indebted to C. L. Monroe, Gold Commissioner at Atlin, for much of the information given below.

The output of placer gold has been about the same as for the last two years, several of the largest operators being still engaged in development-work and not yet on a producing basis.

*Pine Creek.*—At the lower end good progress was made again this year by A. Sostad, who is in charge of work on the Discovery Mining and Power Company's ground. The cut which was started two years ago below the canyon in Pine creek to pick up the old channel has been advanced another 650 feet up-stream and 4 by 4 sluice-boxes installed. Bed-rock was uncovered early in the season, but judging from the dip it was not in the deepest part of the channel. About 550,000 cubic yards of gravel was moved and an average of 18 men employed throughout the season.

As in past seasons, a few individual miners worked ground above Discovery with fair results.

*Spruce Creek.*—Ground is still being worked in the lower part of the creek by Isaac Matthews and others. Some of the old tailings are being rehandled with fair results. On the upper part of the creek Morse & McKechnie ran into good "pay" early in the season and recently took out as high as $20 a day to the man. The Beaton Bros., working still farther up the creek, also struck good values shortly before the end of the season. There seems no reason why good ground should not be found along this creek for quite a distance above the Beaton claims.

*Ruby Creek.*—The lower end of Ruby creek is being worked by the Lake Surprise Mining Company, a reorganization of the Placer Gold Mines Company, which formerly worked this ground. In the latter part of the summer the 1,500-foot drainage-tunnel, which was being driven to reach a shaft sunk in 1916, reached its objective and nearly 400 feet of crosscuts were driven in preparation for next year's mining. The work is being done under the supervision of C. Titus.

On the upper part of Ruby creek E. Turnquist, drifting on his ground with a small crew, took out over $2,000. Mr. Davies, working on ground above Turnquist's, put in the season driving a drain to get under the basalt which overruns the bed of the stream at this point.

*Boulder Creek.*—A number of leases on this creek, owned by the Estate of J. A. Fraser and others, are being worked under an option by the Consolidated Mining and Smelting Company. H. P. Pearce, who formerly operated on Birch creek, is in charge, and splendid progress has been made in spite of an unusually dry season. About 2,800 feet of pipe-line was installed and 170 feet of water-flume constructed. Over 800 feet of sluice-boxes were laid and the cut piped back 720 feet, with a total of over 18,000 yards of gravel moved. It is estimated that another season's work will bring them to bed-rock and "pay."

Nelson & Johnson, working on the ground formerly held by Gus Anderson, had fair returns.

*Otter Creek.*—Only a small crew worked on Otter creek this season, H. Maulin, the manager, having been detained in France on account of ill-health. An examination of the creek was made in September by M. Hardel, an eminent French mining engineer, and it is possible that the property will be taken over by a strong group of French capitalists.

*McKee Creek.*—Geo. Adams has been doing a great deal of exploratory work for the past two or three years in satisfying himself as to the continuity of the pay-streak on the up-stream side of a barren stretch which brought operations to a close some years ago. The Delta Gold Mining Company had worked the lower part of the creek until the values were cut out by a band of gravel, which did not carry gold. In some respects it resembled glacial material, but its position would be difficult to explain as such. The upper limit of the barren stretch was recognized by Mr. Adams and he has demonstrated that good "pay" occurs on the upper side of it and continues for many thousand feet. Near the end of August of this year the main pit had been advanced to the upper side of the barren gravels and good "pay" found. There is every reason to believe that this creek will be a heavy producer for some time to come.

*Consolation Creek.*—This creek, situated about 35 miles east of Atlin, and flowing into the north end of Gladys lake, is owned by a group of local men and has been considered one of the largest and most promising undeveloped hydraulic properties in the district. In November it was optioned to R. W. Foster, representing New York capital, who proposes to commence operations as soon as weather conditions permit in the spring.

# NORTH-EASTERN MINERAL SURVEY DISTRICT (No. 2).

By Douglas Lay, Resident Mining Engineer.

## INTRODUCTORY.

The North-eastern Mineral Survey District consists of Omineca, Cariboo, Quesnel, and Peace River Mining Divisions, and occupies a large portion of Northern British Columbia, having an area of nearly 100,000 square miles. The northern, western, and southern boundaries of this district are the arbitrary boundary-lines of the Mining Divisions, and these, where practicable, always follow the watersheds of the country. The eastern boundary is the British Columbia-Alberta boundary-line. The western boundary is roughly 100 miles from the Coast, while the northern and southern boundaries are about 200 miles from the respective Provincial boundaries.

For descriptive purposes in this report the district is reviewed under the main headings of the Mining Divisions, subdivided into sections, as given below. As far as practicable, a section is named after the chief town or place therein. It will be obvious where this is not the case.

Omineca Division—Skeena section; Hazelton section; Smithers section; Telkwa section; Houston section; Topley section; Burns Lake section; Sibola section; Manson section; Fort Grahame section.

Cariboo Division—Barkerville section; Prince George section.

Quesnel Division—Quesnel section; Likely section; Keithley section; Horsefly section.

Peace River Division.

A general description of the geographic, geologic, and topographic features of the district was given in the Annual Report of the Minister of Mines for 1917. In the following table is given a list of the more important reports on this district, in addition to which numerous references can be found in the Summary Reports of the Geological Survey and the Annual Reports of the British Columbia Department of Mines.

List of Reports on District.

| Name of Author. | Publication. | Year. | Page. |
|---|---|---|---|
| Dr. Geo. Dawson | Geological Survey of Canada | 1875 | 233 |
| Dr. Geo. Dawson | Geological Survey of Canada | 1876 | 17 |
| Dr. Geo. Dawson | Geological Survey of Canada | 1879 | Pt. B |
| Dr. Geo. Dawson | Geological Survey of Canada | 1888 | 73R |
| Amos Bowman | Geological Survey of Canada | 1887–8 | Pt. C |
| R. G. McConnell | Geological Survey of Canada | 1894 | 5C |
| W. Fleet Robertson | Minister of Mines' Report | 1905 | 89 |
| W. Fleet Robertson | Minister of Mines' Report | 1906 | 101 |
| W. Fleet Robertson | Minister of Mines' Report | 1908 | 66 |
| W. Fleet Robertson | Minister of Mines' Report | 1911 | 95 |
| W. Fleet Robertson | Minister of Mines' Report | 1912 | 65 |
| W. W. Leach | Geological Survey of Canada, Summary Report | 1906 | 35 |
| W. W. Leach | Geological Survey of Canada, Summary Report | 1907 | 19 |
| W. W. Leach | Telkwa River and Vicinity, Geological Survey | 1907 | ..... |
| W. W. Leach | Geological Survey of Canada, Summary Report | 1908 | 41 |
| W. W. Leach | Geological Survey of Canada, Summary Report | 1909 | 61 |
| G. S. Malloch | Geological Survey of Canada, Summary Report | 1910 | 91 |
| R. G. McConnell | Geological Survey of Canada, Summary Report | 1911 | 92 |
| G. S. Malloch | Geological Survey of Canada, Summary Report | 1912 | 55 |
| G. S. Malloch | Geological Survey of Canada, Summary Report | 1912 | 69 |
| C. F. J. Galloway | Geological Survey of Canada, Summary Report | 1912 | 103 |
| W. M. Brewer | Minister of Mines' Report | 1912 | 118 |
| John D. Galloway | Minister of Mines' Report | 1914 | 101 |
| J. D. MacKenzie | Minister of Mines' Report | 1914 | 176 |
| Chas. Camsell | Geological Survey of Canada, Summary Report | 1915 | 62 |
| John D. Galloway | Geological Survey of Canada, Summary Report | 1915 | 70 |
| John D. Galloway | Minister of Mines' Report | 1916 | 134 |
| John D. Galloway | Minister of Mines' Report | 1917 | 86 |
| B. R. MacKay | Minister of Mines' Report | 1918 | 107 |
| J. J. O'Neill | Summary Report, Part B, Geological Survey | 1918 | 39 |
| | Memoir 110, Geological Survey | 1919 | ..... |

LIST OF REPORTS ON DISTRICT—*Continued.*

| Name of Author. | Publication. | Year. | Page. |
|---|---|---|---|
| B. R. MacKay | Summary Report, Part B, Geological Survey | 1919 | 36 |
| John D. Galloway | Minister of Mines' Report | 1919 | 96 |
| J. C. Gwillim | Oil Survey, Peace River District, Department of Lands | 1920 | ..... |
| John D. Galloway | Minister of Mines' Report | 1920 | 79 |
| John A. Dresser and Edward Spieker. | Oil Survey, Peace River District, Department of Lands | 1920 | ..... |
| Leopold Reinecke | Memoir 118, G.S.C. | 1920 | ..... |
| F. H. McLearn | Summary Report, Part B, G.S.C. | 1920 | 1 |
| R. W. Brock | Summary Report, Part A, G.S.C. | 1920 | 81 |
| John D. Galloway | Minister of Mines' Report | 1921 | 89 |
| W. A. Johnston | Summary Report, Part A, Geological Survey | 1921 | 59 |
| John A. Dresser | Oil and Gas in Peace River, Summary Report | 1922 | ..... |
| John D. Galloway | Minister of Mines' Report | 1922 | 95 |
| W. A. Johnston | Summary Report, Part A, Geological Survey | 1922 | 68 |
| W. L. Uglow | Summary Report, Part A, Geological Survey | 1922 | 82 |
| F. H. McLearn | Summary Report, Part B, Geological Survey | 1922 | 1 |
| John D. Galloway | Minister of Mines' Report | 1923 | 95 |
| George Hanson | Summary Report, Part A, Geological Survey | 1923 | 29 |
| John D. Galloway | Minister of Mines' Report | 1924 | 85 |
| George Hanson | Summary Report, Part A, Geological Survey | 1924 | 19, 38 |
| M. E. Hurst | Summary Report, Part A, Geological Survey | 1924 | 44 |
| J. R. Marshall | Summary Report, Part A, Geological Survey | 1924 | 47 |
| John D. Galloway | Summary of Mining Operations, Jan. 1st to Aug. 31st, British Columbia Department of Mines | 1925 | ..... |
| Douglas Lay | Minister of Mines' Report | 1925 | 118 |
| John D. Galloway | Summary of Mining Operations, Jan. 1st to Oct. 31st, British Columbia Department of Mines | 1926 | ..... |
| George Hanson | Summary Report, Part A, Geological Survey | 1925 | 100 |
| R. H. B. Jones | Summary Report, Part A, Geological Survey | 1925 | 120 |
| W. A. Johnston and W. L. Uglow | Placer and Vein Gold Deposits of Barkerville, Cariboo District, British Columbia; Memoir 149, Geological Survey of Canada | 1926 | ..... |
| Douglas Lay | Minister of Mines' Report | 1926 | 116 |
| John D. Galloway | Preliminary Review and Summary of Mining Operations for the Year 1927, British Columbia Department of Mines | 1927 | ..... |

## GENERAL SUMMARY.

A brief explanation of the form followed in the compilation of the annual report of this district seems advisable. Under the heading "General Summary" the aim is to give first a concise but comprehensive statement embodying in a few paragraphs the salient features of the year. Next follows an amplification of the foregoing, under appropriate headings, but without any detail. In this portion of the report special mention is made of any matters of particular interest, such as "Prospecting," "New Discoveries," and so forth. Lastly follows the detailed report under the headings of the various Mining Divisions, arranged by sections.

Great activity has been evinced during the year in both lode- and placer-mining fields, and coal-mining possibilities are undergoing close investigation.

Important construction-work has been carried out by Duthie Mines, Limited, at the *Henderson* mine on Hudson Bay mountain, near Smithers, and by the Duke Mining Company, Limited, at the *Silver Cup* mine, Nine-mile mountain, near Hazelton. In this connection the most important event has been the construction and subsequent successful operation of a modern 50-ton flotation concentrator by Duthie Mines, Limited.

While actual production of both lode mineral and placer gold shows a considerable decrease compared with that of last year, it is not to be inferred that there is ground for apprehension as to the future. Decrease in lode-mineral production is almost entirely due to the fact that Duthie Mines, Limited, suspended shipments entirely during the period of construction above referred to, and the activities of the Duke Mining Company, Limited, centred entirely on construction until towards the end of the year. Decline in placer-gold production is to be attributed to the fact that the Kafue Copper Development Company's dredge was not engaged in digging gold-bearing gravel until towards the end of the year and to a decline in the yield from Cedar

creek, which there are grounds for hoping will prove only temporary. Finally, the *Kitchener* mine on Keithley creek had no "clean-up," for reasons, it is stated, which are not connected with its powers of production.

In lode-mining, although there has been disappointment in one or two directions, underground development has been, on the whole, distinctly satisfactory—notably at the *Henderson* mine, Hudson Bay mountain (Duthie Mines, Limited), and at the *Seven Sisters* group, Seven Sisters mountain (D.W. Mines, Limited). The number of new properties coming under attack makes it evident that operators are not deterred by the somewhat depressed metal market. Thus, in addition to the two above-mentioned properties, the following are under more or less active development this winter: *Valhalla* and *Kleanza* groups, Kleanza mountain, Usk; *American Boy*, Nine-mile mountain, Hazelton (Harris Mines, Limited); *Silver Cup*, Nine-mile mountain, Hazelton (Duke Mining Company, Limited); *Mohawk* group, Four-mile mountain, Hazelton (by Edward G. Brown); *Victory* group, Hudson Bay mountain, Smithers (by J. J. O'Brien); *King Tut* group, Hudson Bay mountain, Smithers (by J. J. O'Brien); Mount Evelyn Mines, Limited, Hudson Bay mountain, Smithers; *Red Top* group, Topley (Topley-Richfield Mining Company, Limited); *Golden Eagle group*, Topley (by D. Heenan and C. Matheson, owners); *Ferguson* group (formerly known as *Trout Lake* group), Ingenika river (Selkirk Mining Syndicate, Limited); and, lastly, *Rainbow* group and neighbouring claims, Cow mountain, Barkerville (Cariboo Gold Quartz Mining Company, Limited). In addition to which, the fact that an option has been acquired on the *Emerald* group, Sweeney mountain, in the Sibola section of the Omineca Mining Division, by the Consolidated Mining and Smelting Company of Canada, Limited, points to the likelihood of action in this section during 1928.

In placer-mining, throughout the Cariboo and Quesnel Mining Divisions, an optimistic feeling prevails. From the systematic drilling operations carried on respectively by General F. A. Sutton, by G. A. Dunlop, and by operators on Cedar creek much is hoped. Satisfactory results have already been gained in one or two directions, and G. A. Dunlop states that his principals contemplate the installation of a small modern bucket dredge on the area drilled on Pine and Summit creeks.

While nothing spectacular in the way of new discoveries has been made during the year, prospects of merit have come to light, further mention of which is made in the body of this report.

In the non-metallic mineral class the General Holding Company, Limited, has employed a force of ten men all summer on its mica property on Mica mountain, near Fort Grahame. The deposits of diatomaceous earth near Quesnel have also received attention from various interested parties.

Victor Dolmage and party, of the Geological Survey, made a reconnaissance survey of the Fort Grahame section of the Omineca Mining Division. This section was also visited by J. M. Turnbull.

General F. A. Sutton and party made a trip through the northern portion of the district to examine mineral and other possibilities.

Summing up the results of the year, it may be stated that while that element of disappointment inherent to mining development has been experienced, nevertheless it is far outweighed by the general promising outcome of development and very distinct progress has been made.

The writer desires to express his thanks to the prospectors, operators, and mining men of the district for the many courtesies extended.

### Lode-mining.

An important feature of the year's activities was the construction at the *Henderson* mine, by Duthie Mines, Limited, of a thoroughly modern 50-ton flotation concentrator, which was put into operation on July 13th. Excellent metallurgical results have been achieved, and an addition to the plant, in the form of a large crusher and a set of rolls, is in process of installation. This, it is estimated, will increase the capacity very considerably. Operations towards the close of the year were somewhat hampered by a shortage of mill-water caused by severe weather. An extensive mine-development programme was also carried out, comprising the running of a crosscut adit at the level of the mill ore-bin, and an upraise from this level connecting with the winze previously sunk from the compressor level. In addition, a large amount of drifting was performed on both the Fault Plane vein and the Main vein. Extremely high-grade ore was encountered at the horizon of the new tunnel.

The Duke Mining Company, Limited, has also been engaged in an extensive campaign of construction-work at the *Silver Cup* on Nine-mile mountain, near Hazelton, comprising the installation of an aerial 2-bucket tram, 3,200 feet long, 50-horse-power Saffle Diesel engine, Ingersoll-Rand compressor, and various buildings. This property was in a position to enable shipments of ore to be resumed towards the close of the year.

At the *Sunrise*, Nine-mile mountain, Hazelton Sunrise Mines, Limited, was engaged in running a crosscut tunnel during a portion of the year. At the *American Boy*, Nine-mile mountain, small-scale operations were carried on by Harris Mines, Limited.

The *Valhalla* and *Kleanza* groups, Kleanza mountain, near Usk, are being operated by the Columario Gold Mines, Limited. Camp buildings are being enlarged and the intention is to carry on small-scale mining operations this winter.

At the *Seven Sisters* group, Seven Sisters mountain, Cedarvale, D.W. Mines, Limited, has kept a small crew continuously engaged on development. Highly promising results have recently been obtained which augur well for its future.

At the *Mohawk* group, Four-mile mountain, Hazelton, small-scale operations were started on December 1st by Edward G. Brown and will be continued during the winter.

Hudson Bay mountain, near Smithers, is the scene of much activity in addition to the operations of Duthie Mines, Limited. In the late fall options were acquired by John J. O'Brien on the *Victory* and *King Tut* groups, both situated on this mountain in close proximity to the property of Duthie Mines, Limited. Contracts were let for 500 feet of drifting at each property. This work is now in progress and will be carried on during the winter. On the north-eastern slope of the same mountain Mount Evelyn Mines, Limited, has employed a small force on development, which it is anticipated will be continued during winter.

The Standard Silver-Lead Mining Company relinquished its option on the *Red Top* group, Topley, in July, after sinking to a point approximately 50 feet below the original crosscut tunnel and carrying out approximately 600 feet of tunnelling at this horizon. The action of this company in leaving its assay plan with the owner is most commendable. The Topley-Richfield Mining Company was subsequently incorporated to operate this property. A highly efficient small power plant was installed, comprising a 50-horse-power Vickers-Petter oil-engine driving a 10-inch by 10-inch Ingersoll-Rand air-compressor. The mine was unwatered by the end of November and preparations made to follow up some promising showings of ore.

The Taltapin Mining Company, Limited, installed an air-compressor and carried out some development-work at its property on Taltapin creek, Babine lake.

At the *Ferguson* (formerly *Trout Lake*) group, Ingenika river, the Selkirk Mining Syndicate, Limited, carried on development all summer, and contemplates continuing work this winter with a force of nine men.

On Mica mountain, Finlay river, near Fort Grahame, the General Holding Company, Limited, has been engaged in development with a force of ten men. On the same mountain H. Ravenal has done work on his mica property.

In the Cariboo Mining Division the Cariboo Gold Quartz Mining Company, Limited, is running a crosscut from Lowhee creek to probe in depth the vein system exposed on the *Rainbow* and neighbouring groups on Cow mountain, the results of which will be awaited with interest.

An exceptionally early winter and very severe weather somewhat seriously hampered mining operations during November and December.

### List of Shipping-mines.

The following is a list of shipping-mines in the No. 2 District for 1927:—

| Name. | Ore. | Gold. | Silver. | Copper. | Lead. | Zinc. |
|---|---|---|---|---|---|---|
| Omineca Mining Division— | Tons. | Oz. | Oz. | Lb. | Lb. | Lb. |
| Henderson | 3,850 | 156 | 168,161 | ..... | 387,270 | 261,861 |
| Little Joe | 10 | 4 | 1,312 | 779 | ..... | ..... |
| Silver King | 7 | 2 | 627 | 200 | 642 | 653 |
| Harvey group | 5 | 3 | 256 | 365 | ..... | ..... |
| Silver Cup | 28 | ..... | 2,716 | ..... | 10,976 | 6,048 |
| Cariboo Mining Division— | | | | | | |
| Pioneer | 4 | ..... | 25 | ..... | 258 | ..... |
| Last Chance | 1 | ..... | 11 | ..... | 37 | ..... |
| Totals | 3,905 | 165 | 173,108 | 1,344 | 399,183 | 268,562 |

### Placer-mining.

The placer-output of No. 2 District for 1927 was 5,857 oz. of gold, valued at $99,569, as compared with $295,028 in 1926.

*Cariboo and Quesnel Mining Divisions.*—The Kafue Copper Development Company's dredge was engaged for the greater part of the year in digging its way back from Antler creek to Cunningham pass and did not commence digging gold-bearing gravels until the end of the year.

Hydraulic mines generally had a good year. The *Lowhee* mine on Lowhee creek, managed by John Hopp, encountered virgin ground and had a good "clean-up." The smaller hydraulics in the Barkerville section generally had satisfactory results.

A feature of the year was the extensive and systematic drilling campaigns carried on at various points—notably by F. A. Sutton, by G. A. Dunlop, and by the operators on Cedar creek. General Sutton, having acquired options on a number of properties, established a central camp at Pleasant valley, 2½ miles from Barkerville, and engaged in active drilling in Pleasant valley and on French creek. G. A. Dunlop, acting on behalf of San Francisco interests, completed a campaign of drilling started last year on Pine and Summit creeks, as a result of which he states that a small modern bucket dredge will probably be installed in this area.

The Consolidated Mining and Smelting Company of Canada, Limited, continued development of the H. C. Carry leases on upper Antler creek, and late in the season acquired, it is understood, an option on the *Ketch* hydraulic property on Slough creek.

On Cedar creek K. C. Laylander, having acquired options on a number of properties, including that of the Cedar Creek Mining Company, optioned this consolidation to parties whose names are not divulged. The optionees carried out an extensive drilling campaign. While the results of this have not been disclosed, it is understood that an extensive yardage of commercial ground has been proved. Prior to this consolidation B. Boe carried on pump hydraulic operations, which were subsequently continued by K. C. Laylander.

The well-known *Bullion* mine was operated by Ross, Holland & Ulsh under a lease and bond. Much preliminary laborious work was accomplished and some 6,000 cubic yards of bedrock gravel was subsequently piped off.

On Morehead creek the Morehead Mining Syndicate had a small force engaged in testing operations and carrying out a topographic survey under the supervision of E. C. Annes. This property possesses indications of an hydraulic of magnitude and merits careful investigation.

*Omineca Mining Division.*—Small-scale operations were carried on by W. B. Steele, Ah Lock, W. C. Lesster, and C. Allen on their respective leases on Germansen creek; by W. McCormick on Tom creek; by Lee Tong and associates on Vital creek; by D. Purvis on Klawli creek; and by P. Jensen on McConnell creek, a tributary of the Ingenika river. With the exception of the last mentioned, all these creeks are in the Manson section.

In the Sibola section, on Sibola creek, some prospecting was carried on by the New Westminster Partnership, Limited, under J. W. Ray.

In connection with the attempts of G. W. Otterson and W. M. Ogilvie respectively to get machinery into Manson creek from Fort St. James, it may be said that the equipment of the former is now within 35 miles and that of the latter within 15 miles of the objective. It is understood that the attempt will be renewed this winter.

### Non-metallic Minerals.

A shipment of 500 lb. of mica was made by General Holdings Company, Limited, from its mica property on Mica mountain, Fort Grahame section of the Omineca Mining Division.

### Coal-mining.

Telkwa Collieries, Limited, carried on small-scale operations during the year at its Goat Creek Colliery, 5½ miles from Telkwa, keeping pace with the demands of the local market, which was brisk during the last two months of the year owing to the severe weather prevailing.

Investigation of the Seaton coal-measures on both sides of the Bulkley river is being carried out by the Bulkley Valley Coal Mines Syndicate under the supervision of Francis Glover. Some mining operations were accomplished with a view to making a trial shipment of this coal. Seaton is a flag-station on the Canadian National Railway, about midway between Hazelton and Smithers.

### Coal.

The output of coal was 1,691 long tons, as compared with 1,260 long tons in 1926. This coal was produced by the Telkwa Collieries, Limited, and the Canadian National Anthracite Syndicate.

### Roads and Trails.

Substantial aid was given during the year by the Department of Mines in connection with mining roads and trails at all points of the district.

While the most sympathetic attitude is shown by the Department of Mines in this matter, it is advisable to again urge applicants to bear in mind that funds available under the "Mines Development Act" are comparatively small, having regard to the demands upon them. Further, while new and promising sections in this district have been opened up during the year as the result of assistance given, there are many other promising sections throughout the Province generally. All such are entitled to, and must receive, due consideration.

Among major items in connection with grants for roads and trails during the year may be mentioned the following:—

*Omineca Mining Division.*—Legate Creek trail; sleigh-road from Fort St. James to Manson Creek; Nine-mile Mountain road, Hazelton; Duthie Mines road, Smithers; Telkwa Collieries road, Telkwa; branch road from Topley–Babine Lake road.

*Cariboo Mining Division.*—Hixon Creek road; Stanley to Houseman Creek road.

*Quesnel Mining Division.*—Likely to Cedar Creek road; Hydraulic to Beavermouth road.

In the majority of cases grants were for repairs or improvements to existing roads or trails.

In addition to the foregoing, assistance was given in connection with numerous trails throughout the district.

### New Discoveries.

While no spectacular discoveries were made during the year, among prospects of merit may be mentioned the following:—

(1.) *Stella* group, distant 5 miles south-west of Endako (Canadian National Railway)—a discovery of molybdenite by A. Langley and associates.

(2.) *Swannell* group on Swing Peak mountain, south side of Tahtsa river, Sibola section, Omineca Mining Division—a discovery of galena and zinc-blende carrying good silver values, made last year by George Seel.

(3.) *Sunset* group, Whitesail lake, Sibola section, Omineca Mining Division—a fresh discovery, on an old location, of galena with a preponderance of zinc-blende, made by C. V. Harrison and associates.

(4.) *Golden Eagle* group, 6 miles north of Topley. The owners report the discovery of ore carrying high silver values and expect to make a shipment early next year. They intend working at their property during the winter. This property was examined by the Resident Engineer before, but not subsequent to, this discovery.

(5.) *Richmond* group, McDonald island, Babine lake, owned by H. J. Macdonald, Burns Lake. This property is not a new discovery, but was examined this year for the first time by the Resident Engineer. The essential feature is a large intrusion of batholithic rock in the volcanics. The entire mass of batholith is mineralized with copper pyrites and malachite. Grab-sampling indicates somewhat low copper values, probably not exceeding 1 per cent. copper in the better portions. The property merits systematic sampling to determine the advisability of diamond-drilling. At the points of contact of the batholith with the volcanics, veins carrying galena and zinc-blende seem likely to be found.

In addition to the above, an occurrence of oil-shale at Sucker creek, Horsefly section, Quesnel Mining Division, might be mentioned. While not a new discovery, it is of interest.

Full particulars of the foregoing will be found in the body of this report in the sections concerned. Mention of them is made here to facilitate reference.

### Prospecting.

In the Annual Reports for the years 1917, 1921, and 1923 very full general information will be found on the subject of prospecting, likewise a detailed account of the physiographic and

geologic features of the district. In the 1926 Annual Report will be found a fairly full account of the Nechako plateau, and of the Pre-Cambrian strip in the Fort Grahame section. These reports should be carefully studied by those interested. Information of great value will also be found in "Geology and Economic Minerals of Canada," by G. A. Young, published by the Geological Survey of Canada.

Discoveries made last year and this year in the vicinity of Topley are outstanding examples of what may yet be found in areas immediately adjacent to transportation. The importance of thoroughly prospecting such before going farther afield is apparent for many reasons, and it is desired to again emphasize this.

Recent discoveries and developments indicate the importance of the following points:—

(1.) In the region more immediately adjacent to the contact of the Coast Range batholith with the volcanics and sedimentaries of the interior, developments on Seven Sisters mountain should stimulate further search in this region, on both sides of the Skeena river. North of the Skeena river, close to Woodcock, on the Canadian National Railway, there is an outcrop of batholithic rock in the sedimentaries and the region merits close prospecting. By following up Sedan creek an idea of the formation should be gained, likewise reasonably convenient access to the region. The country opposite Woodcock, on the south side of the Skeena river, likewise that in the vicinity of Oliver creek, would appear to be promising.

Considerably farther south in the same mineral-belt, in the Sibola section, the discovery by George Seel on the *Swannell* group indicates that high-grade ore exists in this section, which may go far to offset the geographic disability from which it suffers. In this connection it might also be mentioned that sampling of the *Stanley* group on Sweeney mountain also disclosed the evidence of quite good silver values in the galena. This ore also carried values in gold. There is sufficient evidence, therefore, to support the view that galena ore of good silver grade yet awaits discovery in this section. The lakes and rivers in this section afford a ready means of access.

(2.) The Nechako plateau. Discoveries made this year near Topley and Endako and the examination of other portions of this plateau strengthen the views expressed as to its promising nature in the Annual Report for 1926. It is evident that outcrops of granitic rock are likely to be quite frequent in this region, and in the vicinity of the contact of such with the volcanics and sedimentaries mineralization is to be expected.

(3.) The Pre-Cambrian areas. The Finlay River area undoubtedly is a highly promising region for large lead-zinc deposits and the hope of finding such an incentive to prospecting so far afield.

Another Pre-Cambrian area exists comparatively close to transportation in the vicinity of Tete Jaune Cache, on the Canadian National Railway. It might be well to mention that in the Finlay River area quartzites and limestone occur immediately west of the mica-schist rocks. If such should be the case also near Tete Jaune Cache, then such rocks should be well worth prospecting for lead-zinc deposits.

(4.) Association of mariposite with placer gold. From field evidence it has been ascertained that in placer-gold districts the prevalence of the mineral mariposite in the rocks is quite noticeable, so much so as to incline the belief that this association may be turned to account in prospecting for placer or vein gold. Mariposite is a silicate of aluminium, potassium, and magnesium, of a bright-green colour, and *per se* of no commercial importance (unless as an ornamental stone for building). It is frequently mistaken for copper-stain, but can readily be distinguished from such with the magnifying-glass, which shows it to be glassy and transparent. It usually occurs in the placer-gold districts in silicified schistose rocks, which also contain noticeable amounts of iron pyrites, and therefore weather to a rusty-brown or red colour. Such rocks and their mariposite content are especially noticeable in the Manson section of the Omineca Mining Division and in the Quesnel Mining Divison. The association of mariposite and placer gold is probably due to the fact that those rocks which develop mariposite also develop the quartz veins from which the placer gold originated. It is suggested that, in prospecting for placer gold, bands of rusty rocks be looked for. If on breaking they are found to contain mariposite, the inference is that creeks cutting through such rocks are worth prospecting for placer gold. It is thought that this fact may be of service in prospecting in the Manson section and country north of this, which regions have probably not been so intensively prospected as the southern placer areas.

### Note re "Gross Value."

The misunderstanding which exists as to the real value of lead and zinc ores is evidently a "hardy annual." On assay certificates the gross value of the ore is frequently given, expressed in dollars and cents. Those unfamiliar with ore valuation are strongly urged to note that in the case of lead and zinc ores such "gross value" should not be used in estimating the amount likely to be realized by shipment of ore of the grade shown by the assay certificate. Reasons for this will be found under the same heading as this paragraph in the Annual Report for 1926, to which reference is invited.

### Smelting Rates.

Attention is drawn to the fact that under date of January 15th, 1927, the Consolidated Mining and Smelting Company of Canada, Limited, modified its schedule for lead ores in favour of the shipper, now paying for 92½ per cent. of the lead contents, instead of 90 per cent. as formerly.

### Subsidy on Powder used by Prospectors.

*Bona-fide* prospectors are reminded that a subsidy is paid by the Department of Mines to the extent of 25 per cent. of the legitimate retail cost on powder actually used in prospecting. Copy of the regulations can be obtained upon application to the Department of Mines.

### Cost of Transportation.

The following figures are representative of average costs prevailing in this district:—

*Railway Transport.*—Six cents a ton-mile for L.C.L. lots; 2½ cents a ton-mile for car-load lots. Transport of ore depends upon the value and is as low as ¾ cents a ton-mile.

*Motor-truck Transport.*—For large quantities of freight on good roads, from 22 to 42 cents a ton-mile. On bad roads the cost may greatly exceed this.

*Pack-horse Transport.*—For large quantities of freight over good trails, $1.25 a ton-mile. For small quantities of freight an approximate figure is $2 a ton-mile.

*Water Transport on Swift Rivers.*—With large craft plying, up-stream rate from 24 to 50 cents a ton-mile; down-stream rate about one-quarter of the foregoing.

### Addresses.

During the winter addresses were given by the Resident Engineer, as usual, at various centres throughout the district on matters connected with developments and prospecting, for the purpose of disseminating information helpful to prospectors and others interested in mining in the district.

## OMINECA MINING DIVISION.

### Skeena Section.

#### *Zymoetz (Copper) River.*

Properties up the Zymoetz river are conveniently reached from Dobies, a flag-station on the Canadian National Railway on the north side of the Skeena river. A ferry at this point transfers passengers to Copper River, at which place there is a post-office and Sub-Recorder's office. The Sub-Recorder, L. G. Skinner, keeps a store at which general supplies can be procured.

**Dardanelle.** This group, owned by A. Carmichael and S. McNeil, is situated on the right bank of the Zymoetz river and is distant 14 miles from Copper River Post-office. The main trail passes through the property. In greenstone in the immediate vicinity of an intrusion of granodiorite, which latter is the prevailing country-rock, there is exposed by short tunnels, shallow shafts, and open-cuts a system of quartz veins, somewhat sparingly mineralized with iron and copper pyrites, galena, and zinc-blende. There appear to be three veins, of which two are only about 20 feet apart, being separated by an aplitic dyke of this width. The third is distant about 150 feet from the nearer of the other two. These veins are approximately parallel and strike N. 70° E. (mag.), with steep north-westerly dips. They run diagonally up the somewhat steep bank of the Zymoetz river and can be traced on the surface for several hundred feet. Exposures lie between 475 and 975 feet elevation above sea-level, the lowest exposure being about 125 feet above the river. The width of the veins varies from 2 feet to 7 feet.

At 475 feet elevation a tunnel follows one vein from the surface for a distance of 35 feet, exposing an average width of 2 feet of quartz with small amounts of galena, zinc-blende, iron pyrites, and chalcopyrite. At 600 feet elevation a shaft has been sunk a few feet on the more easterly of the two veins, separated by the aplitic dyke, and a tunnel, now caved, was said to be run a distance of 12 feet on the more westerly of these veins. A sample taken across a width of 4 feet at the collar of the shaft assayed: Gold, 0.12 oz. to the ton; silver, 2 oz. to the ton; lead, *nil;* zinc, 1 per cent. At about this horizon an open-cut exposes a third vein distant about 150 feet in a south-easterly direction, showing a width of about 7 feet of mainly quartz. At 900 feet elevation, in the immediate vicinity of a granodiorite intrusion, an open-cut again exposes the two former veins, with the dyke between them. The width of the more westerly vein is 4½ feet and that of the more easterly 3½ feet. A sample taken at this point of the former showed only traces of gold and silver. At this point a shaft was sunk a depth of 40 feet on the more westerly vein and a crosscut run at this depth to the other vein. At the time of inspection the shaft was partly filled with water.

The most recent work on this property consists in uncovering the more westerly of these veins at an elevation of 975 feet, at a point some hundreds of feet distant from the last-mentioned shaft. At this point a width of 1½ feet of decomposed quartz shows, which contains much the same mineralization observed at other points. A sample taken across this width assayed: Gold, 1 oz. to the ton; silver, 4 oz. to the ton; lead, *nil;* zinc, 1 per cent. The wisdom of further work at this point is apparent. In the case of parallel veins, as is well known, ore-shoots are likely to occur opposite one another, such that the development in one vein indicates the most promising regions in a parallel vein.

This property is reasonably close to transportation; the topography lends itself to cheap mining—that is, development by drifts from the surface; the vein system is well defined and seems likely to prove persistent; when developments warrant such, near-by water-power can be rendered available. While samples taken, save in the case of the most recent exposure, yielded somewhat low results, it is possible that a systematic sampling of the older exposures might indicate better values. In any case, further work on the most recent exposure is clearly justified, and it is quite possible that ore-shoots of commercial value will be disclosed in this vein system.

Further mention of this property will be found in the Annual Reports for the years 1914, 1918, and 1921, and also in the Summary Report, 1925, Part A, Geological Survey, page 115. This last-mentioned report also contains a detailed account of the geology of the Zymoetz River area.

**Lead King.** This group, owned by Verner Roy and W. Dahl, is situated in a basin draining into 8-Mile Creek basin; 8-Mile creek flows into the Zymoetz river from the south. The property is at present reached by a circuitous route from Terrace. From a point on the Terrace–Lakelse Lake road, distant 6 miles from Terrace, a trail leads up Thornhill mountain to the summit of the latter (elevation of which is 5,180 feet above sea-level), follows the summit south-westwards for perhaps 4 miles, and then drops down into the *Lead King* basin. The walls of this basin are steep, in places precipitous, and upwards of 2,000 feet in height. Mineral-exposures are mainly in the east wall of the basin. The predominating country-rock is granodiorite, in which occur small areas occupied by volcanic flow-rocks. The principal mineral occurrence is a quartz vein about 2 feet in width, exposed by several open-cuts along its dip, between elevations 3,030 feet, the level of the floor of the basin, and 3,625 feet. At the highest point of exposure the vein is abruptly terminated by a fault and has not been found above this point. The vein shows a very considerable amount of galena and some iron pyrites and zinc-blende. The possibility of sorting by hand a lead product of good grade in lead is apparent. A sample of picked pieces of the ore assayed: Gold, 0.16 oz. to the ton; silver, 21.5 oz. to the ton; lead, 34 per cent.; zinc, 0.5 per cent. This vein occurs in a volcanic flow-rock in the immediate vicinity of the contact of granodiorite with the latter. The vein dips at an angle of about 45° westerly. At higher points two other small quartz veins showing a similar mineralization occur in the walls of the basin.

The owners have built a good cabin on the floor of the basin close to the mineral-showings and have accomplished much work on their prospect during the year. The logical mode of access to this property is obviously via the Zymoetz River trail, and it is the intention of the owners to construct a branch trail from this main trail to their property next year.

At an elevation of 3,790 feet, in the central portion of the *Lead King* basin, a belt of volcanic flow-rock about 50 feet in width is heavily stained with iron caused by the oxidation of veinlets of arsenopyrite which occur in these rocks. The latter are intruded by a tongue of granodiorite. Assay of picked samples of this arsenopyrite showed only traces of gold and silver.

**Eureka.** This claim, owned by Michaud Bros., of Terrace, is situated on the summit of Thornhill mountain. Within an area of about 300 by 200 feet in the batholith, at several points occur small pegmatitic phases of the granitic rock which show coarse flakes of molybdenite and mica in bunches.

*Usk.*

**Valhalla and Kleanza.** These groups, situated on the east side of the Skeena river, 3 miles below Usk, are now under operation by the Columario Gold Mines, Limited, a recent incorporation, with head office in Toronto. The capital stock is $1,000,000. The secretary is W. W. Fair and the resident manager, J. Willman. Work was commenced in November and comprised the erection of larger camp buildings to accommodate more men. The intention is to install a portable air-compressor and drift on the "Tenderfoot" vein and then crosscut to the *Norman* and *Barrier* veins.

There are a number of gold-bearing quartz veins, carrying sulphides, on the property, and it seems a reasonable expectation that ore-shoots of milling grade may be developed. For further information concerning this property refer to the Annual Reports for the years 1920, 1921, and 1925, also to Summary Report, 1925, Part A, Geological Survey, page 117.

**Emma, Four Aces, and Usk.** These groups, which are among the earliest stakings in the district, are now owned or controlled by M. Allison, who has done work on them during the year. The *Emma* group is distant about half a mile from Usk on the east side of the Skeena river, and the claims comprising the group extend tandem-fashion in an almost due easterly direction up the slopes of Bornite mountain. The *Four Aces* group immediately adjoins the *Emma* group on the east, the component claims in this case also extending tandem-fashion in an easterly direction. The claims comprising the *Usk* group immediately adjoin on the north the two first-mentioned groups.

On the *Emma* and *Four Aces* groups the mineral occurrence is that of a strong quartz vein, mineralized as described below, a shear-zone replacement in schisted andesite, striking about N. 85° W. (true), possibly more or less continuous throughout these groups. Owing, however, to the fact that the andesite exhibits very marked transverse shearing, the vein is abruptly terminated and offset in places, the occurrence being rather that of a number of quartz lenses *en echelon* than a continuous vein, although the individual lenses seem likely to be of considerable length.

On the *Usk* group mineralization is parallel to that of the two first-mentioned groups, but time did not permit of its examination. For a description of the *Usk* group refer to the Annual Report for 1923, page 102.

A detailed description of the *Emma* and *Four Aces* groups follows: At 550 feet above sea-level, on the *Emma* group, a tunnel, now caved, is said to have been run a distance of 175 feet, following from the surface a copper-stained quartz vein striking easterly and dipping northerly. The vein is said to be 3 feet wide at the face. A sample of the dump from this tunnel taken by W. M. Brewer in 1914 assayed: Gold, 0.3 oz. to the ton; silver, 1.9 oz. to the ton; copper, 3.3 per cent. This is the lowest exposure. Others extend up the mountain in an almost due easterly direction, and, as has been mentioned, are possibly of the same vein. At 930 feet elevation in a draw is exposed a zone 10 feet wide containing bands of quartz mineralized with copper pyrites, bornite, pyrite, and hæmatite. The country-rock is an andesitic lava-flow. This appears to be a shear-zone replacement; the quartz-bands are separated by country-rock, to which they are "frozen." A sample of picked ore representing a width of 1½ feet assayed: Gold, trace; silver, 3.8 oz. to the ton; copper, 2.7 per cent. At 1,050 feet elevation is exposed another band of slightly mineralized quartz and country-rock. At 1,230 feet elevation a wide quartz vein slightly mineralized with copper-stains is apparent, and about 150 feet ahead of this an open-cut at right angles to the strike of the vein shows only andesite striking due east and west. Just ahead of this a prominent outcrop of schisted andesite shows marked transverse shearing. At 1,700 feet elevation a wide quartz vein is again disclosed by open-cutting. A short distance away an old shaft—probably one of the oldest workings in the vicinity—is sunk a few

feet on a quartz vein 6 feet wide striking north-westerly and dipping northerly. The quartz shows a little pyrites.

While sampling did not show any very high values, it seems quite possible that development will disclose ore-bodies of milling grade. A wide vein showing strength and continuity, nearness to transportation, a topography conducive to cheap exploration by adit-drift, are all encouraging features and some further attempt should be made to localize ore-shoots. A good cabin, built by M. Allison, is situated at 1,300 feet elevation. (*See also* Annual Reports for 1918, 1923, and 1924 (map); also Summary Report, 1925, Part A, Geological Survey, page 116.)

**Diadem.** This group, owned by B. Shannon, is situated near Hanall, 2½ miles east of Usk. (For a description *see* the Annual Report for 1923.) This property was bonded to Seattle interests during the year and some stripping and open-cutting was carried out, which, it is stated, improved the appearance of the property. Operations were suspended in the fall.

*Chimdemash Creek.*

**Shenandoah.** This group is situated on the mountain range between Chimdemash and St. Croix creeks, on the North fork of the former. It is owned by A. A. Macdonald. Time did not permit of inspection, but the owner states that the property is under option to R. W. Seelye, of Seattle. Work done during the year comprised making 8 miles of trail from the main Chimdemash Creek trail, besides surface prospecting. It is the intention next year to run a crosscut, 300 feet in length, to cut the vein at depth. The mineralization is said to consist of essentially zinc-blende. The distance of the property from Usk is about 12 miles. Good maps of the Usk section are to be found in the 1914 and 1924 Annual Reports.

*Legate Creek.*

There are prospects of promise at the head of this creek, of which a fairly full description will be found in the Annual Report for 1925; refer also to Summary Report, 1925, Part A, Geological Survey, page 111. Pacific, a divisional point on the Canadian National Railway, is the town from which all Legate Creek properties may be readily reached. An excellent trail, greatly improved this year, 12 miles in length, with a grade of little over 100 feet to the mile, leads to the head of the creek from the east side of the Skeena river, which is crossed by ferry.

No developments of importance have been reported this year, beyond the fact that the *Zona May* group and other properties were inspected by mining engineers.

*Seven Sisters Mountain.*

**Seven Sisters.** This group, owned by Steve Young, is distant 8 miles by pack-trail from Cedarvale, on the Canadian National Railway. It is under option to the D.W. Mines, Limited, which has carried on work with a small force during the entire year, having erected camp buildings, sufficient to accommodate a force of 12 men, in a convenient location just below timber-line at 4,100 feet elevation. Workings are above timber-line and lie between elevations of 4,300 and 4,500 feet. W. H. O'Conner is in charge of operations.

The salient features of the mineral occurrence are as follows: On the upper western flanks of Seven Sisters mountain, overlooking the Skeena river, not far distant from an intrusion of granitic rock in the argillites and quartzites of the Hazelton series, there is exposed by open-cuts and shallow workings a replacement mineralization. This persists with remarkable regularity and can be readily traced for upwards of a mile in length. It is covered in places with glacial drift somewhat deeply, but in others the cover is very thin or non-existent. At the great majority of points, however, if it has not already been disclosed by natural agencies, it can be readily exposed by surface-trenching. The strike differs but little from true north and south, being on an average perhaps N. 10° W. (true). The dip is flat, at about 30°, and easterly, into the mountain. The strike is such, likewise the topography, that all surface exposures are, broadly speaking, at much the same horizon, lying between elevations of 4,300 and 4,500 feet above sea-level. Further, the mountain-side slopes very gradually away from the surface exposures, at an angle in most places of not over 20°. There is practically no deep dissection of the surface near the mineralization, except at the extreme north and south ends of the property. In the former case Coyote creek affords somewhat deep dissection and at the south end the basin at the head of Flint creek is of great size and depth.

The mineralization is essentially pyrrhotite-zinc blende-galena, with a large amount of accompanying iron pyrites. Silver values evidently vary considerably, but some of the galena lenses containing grey copper show quite high silver values; this class of ore carries from 3 to 4 oz. of silver to the unit of lead. The mineralization appears to be a replacement following the bedding-planes of the enclosing argillitic and quartzite country-rock, although the bedding-planes are somewhat obscured. While quite insufficient work has been done to prove the matter, it seems likely that a belt of rock about 300 feet in width will be found to contain parallel ore-lenses.

Besides the intrusion of batholithic rock, previously mentioned, in the north-eastern portion of the property in Coyote creek, another important geologic feature is the intrusion of certain igneous dykes of andesite porphyry in the sedimentaries. Two of these have been discovered

so far, both of which persist for considerable distances with great regularity. One of these dykes, which has penetrated the mineralized zone, has probably influenced ore-deposition and this relationship should undoubtedly be closely studied.

Last winter, at the point of original discovery of galena of high silver content at 4,285 feet elevation, a shaft was sunk 75 feet on an incline of 32° on a bearing N. 85° E. (mag.). At the collar of the shaft a vertical dyke of andesite porphyry, striking N. 20° W. (true) and about 3 feet wide, penetrates the ore-zone and ore occurs on both sides of it. While the ground encountered showed a considerable amount of massive zinc-blende with a little galena occurring in bunches, it will be noted that this shaft is in the nature of crosscutting, as the bearing is not at right angles to the observed strike of the ore on the surface at this point, which is N. 10° W. (true). Just below the collar of the shaft a tunnel was run a distance of 28 feet on a bearing

S. 12° E. (mag.), which also does not coincide with the observed strike of the ore. Near the bottom of the shaft a crosscut was also run westerly a distance of about 30 feet. In the spring of 1927, owing to water, further sinking was stopped and an extensive system of surface-trenching was carried out south of this point, in the hope that the vein might be found to bear ore as far south as Flint Creek basin; in which event the vein could be advantageously developed in depth by an adit-drift from this basin.

The results of this open-cutting were not, however, very conclusive and the mantle of glacial drift was heavy, in places necessitating deep trenching. Good ore, it is stated, was found at one point distant 1,087 feet from the shaft, and doubtless a very considerable extension of ore-bearing ground is to be expected south of the shaft. On the other hand, examination of the surface showings north of the shaft, coupled with the fact that the intrusion of batholitic rock with injection tongues therefrom is in the extreme northern portion of the property, and, further, that an andesitic dyke striking N. 20° W. (true) penetrates the mineralized zone by the shaft, indicate major possibilities near and north of the latter. With this idea in mind, in September investigation of the region in the more immediate vicinity of the shaft was commenced, with gratifying results. A few feet north of the shaft, and about 15 feet below the latter, an open-cut followed by a crosscut tunnel 86 feet in length struck a width of 4 feet of mixed galena and zinc-blende and pyrrhotite with much calcite. The strike of the ore is N. 10° W. (true), corresponding with that struck at the collar of the shaft and which latter is doubtless the apex. This ore was being followed by drifting at the close of the year. At the time of the inspection in November a width of 2 feet of ore was exposed. A sample across this width assayed: Gold, trace; silver, 7.5 oz. to the ton; lead, 3 per cent.; zinc, 18 per cent.

At a point about 300 feet north of the shaft another open-cut exposed a width of 5 feet of ore consisting of zinc-blende and pyrrhotite with some galena. Very little ore showed at the surface at this point. A picked sample of this ore assayed: Gold, trace; silver, 3.6 oz. to the ton; lead, 2 per cent.; zinc, 25 per cent. By Chisholm creek, about 750 feet north of the shaft, there is exposed a nice showing of solid zinc-blende. About 3,000 feet north of the shaft a large area of rock is heavily stained with iron, which probably marks the continuation downward of this mineral-zone. The elevation of this point is 4,530 feet. Still farther north, at an elevation of 4,460 feet, an old tunnel was run in the zone, crosscutting for a distance of 12 feet massive zinc-blende and pyrrhotite. The need of further work at this point is imperative. A sample of the ore at this point assayed 14 per cent. zinc, no lead, and traces only of gold and silver.

A sample of picked galena from the shaft assayed: Gold, trace; silver, 111 oz. to the ton; lead, 48 per cent.; zinc, 6 per cent. A sample of zinc-blende and pyrrhotite from the shaft assayed: Gold, trace; silver, 1 oz. to the ton; lead, *nil;* zinc, 16 per cent.

During the winter of 1927–28 (at which time only underground development is possible) the intention is to drift and sink in the ore which has recently been struck near the shaft. It might be mentioned that in winter very little water is met with in sinking.

When seasonal conditions permit, the advisability of following up the various exposures north of the shaft is apparent. A very large amount of surface-trenching in this region will be necessary to determine the best points for further investigation; indeed, the property has hardly been scratched as yet. While ultimately the ores will require treatment by selective flotation prior to shipment, it is possible that development will yield lenses of galena, which can be hand-sorted and shipped direct. The galena evidently varies widely in silver content.

While this property is still in the prospect stage, it gives promise of developing into a property of magnitude. It is distant in a straight line from the railway probably not over 4 miles. It must therefore be apparent that, when developments justify such, a mill by the railway-track and an aerial tram thereto will satisfactorily dispose of the transportation question. Refer also to the 1925 and 1926 Annual Reports.

**Hercules.** This group is situated at the head of Coyote creek and is owned by Hugh Macdonald, J. B. Robertson, and Frank P. Allen. It lies north-east of the *Seven Sisters* group and may be reached from the latter by climbing the mountain to a pass at an elevation of 5,450 feet which leads to Coyote creek. A rough trail also leads to this group from the Cedarvale trail to the *Seven Sisters* group. Showings on this group are very inaccessible, and, indeed, can only be reached apparently at certain times by climbing snow-banks. The argillitic rocks in this region are very heavily stained in places with

iron, which is quite likely due to the presence of pyrrhotite, as some small seams of zinc-blende and pyrrhotite following the bedding-planes were observed at some lower points. There is an intrusion of batholitic rock with dykes therefrom in this region, which is favourable for the occurrence of mineral similar to that found on the *Seven Sisters* group, which adjoins this group on the south. Indeed, it seems likely that the mineralization of the *Seven Sisters* group is directly due to this intrusion of batholitic rock.

**Hughie.**

This group consists of six claims, owned by M. Orr and J. R. Smith, and is situated on the slopes of Seven Sisters mountain at an elevation of about 1,700 feet and distant about 3 miles from Cedarvale. A short branch trail leads to the property from the *Seven Sisters* trail.

At the time of inspection in May two crosscut tunnels, each about 50 feet in length, had been run at points about 100 feet apart, at an elevation of 1,775 feet, to penetrate at a depth of 25 feet a mineralized zone previously exposed by open-cuts on the surface. The mineralization is in the form of a replacement zone in argillitic country-rock and shows somewhat small amounts of galena, pyrrhotite, iron pyrites, zinc-blende, and a very little chalcopyrite. The width is about 8 feet. The zone strikes N. 26° W. (mag.) and dips at about 60° to the south-west. It is reported that additional ore was discovered subsequent to inspection. In any case it merits further investigation. A sample of the best ore-showing assayed: Gold, trace; silver, 8.8 oz. to the ton; lead, 30 per cent.; zinc, 15 per cent. Refer also to the Annual Report for 1925.

*Woodcock.*

**Morning Star.**

This group of three claims, owned by D. C. MacGregor, is situated about 2 miles north-east of Woodcock, a station on the Canadian National Railway, 6 miles east of Cedarvale. A trail leads to the property from Woodcock. The country-rock consists of sediments—conglomerates, sandstone, and argillites—of apparently Cretaceous age, intruded by a stock of granodiorite. At an elevation of 1,440 feet the granodiorite contacts with argillite and, at the contact, exposure by open-cut shows a number of well-mineralized small quartz-seams extending over a considerable width. These strike N. 35° W. (true), dip at an angle of about 70° south-westerly, and are shown by open-cuts at intervals to extend up the hill in a direction along the strike to an elevation of 1,790 feet. The minerals noted were galena, zinc-blende, pyrite, arsenopyrite, chalcopyrite, and molybdenite. The following assays are of samples of picked portions of mineral only, without any gangue, and were taken merely to ascertain the grade of the mineral in precious metals, and do not represent any definite widths:—Selected sample showing galena, zinc-blende, arsenopyrite, and pyrite of fine grain assayed: Gold, 0.04 oz. to the ton; silver, 3 oz. to the ton; lead, 1 per cent.; zinc, 2 per cent. Another sample showing the same minerals as the preceding sample, but of coarser grain, assayed: Gold, 0.02 oz. to the ton; silver, 8 oz. to the ton; lead, 6 per cent.; zinc, 13 per cent. An oxidized seam 3 inches wide, showing arsenopyrite, assayed: Gold, 0.06 oz. to the ton; silver, 9 oz. to the ton.

There is also evidence of the existence of veins at points some distance west of the above-described exposure, and this property undoubtedly warrants close prospecting, as the geological conditions are favourable for ore-deposition. At one point west of the main exposure, at an elevation of 1,490 feet, a tunnel has been run a distance of 100 feet to intercept the downward continuation of a vein showing on the surface above, but had not encountered any mineral at the time of inspection. In this vicinity there was also noted a small deposit of calcareous tufa, caused by leaching of some lime-bearing rocks situated at a higher elevation.

Some additional surface-stripping in the immediate vicinity of the contact of the batholithic rock with the sediments might be well undertaken to ascertain if there existed any possibility of mining a comparatively wide area of low-grade material.

HAZELTON SECTION.

This year has witnessed quite a revival of activity on Nine-mile mountain, where extensive construction-work has been carried out at the *Silver Cup* mine by the Duke Mining Company, Limited, and development has been undertaken by Hazelton Sunrise Mines, Limited, at the *Sunrise* group, and also by the Harris Mines, Limited, at the *American Boy*. Substantial improvements were made by the Departments of Mines and Public Works to the Nine-mile Mountain road, which has now been continued into the *Silver Cup* basin.

In the fall operations were resumed at the *Mohawk* group on Four-mile mountain by E. G. Brown. The *Silver Standard* remains inoperative, a matter for great regret.

In the Annual Report for 1914 will be found a very clear sketch-map of the chief properties in this section, mention of which will also be found in the Annual Reports for the years 1914, 1917, 1920, 1925, and 1926, and in Memoir 110 of the Geological Survey, by J. J. O'Neill.

*Nine-mile Mountain.*

**Silver Cup.** This property is now operated by the Duke Mining Company, Limited, with Wm. Meurer in charge of operations. Important construction-work has been carried out during the year, comprising the erection of an aerial 2-bucket tram 3,200 feet long from No. 4 tunnel to a point close to the end of the wagon-road; installation of a 50-horse-power Saffle Diesel engine; an Ingersoll-Rand air-compressor; and various new camp buildings. Besides the installation of the additional plant mentioned, surface arrangements generally have been remodelled, resulting in greatly enhanced efficiency. It is also to be noted that, with the exception of No. 1 tunnel, all tunnels have been renumbered. Referring to the map on page 203 of the 1914 Annual Report, under the new nomenclature No. 2 tunnel is an intermediate tunnel run 37 feet vertically below No. 1 tunnel. This new tunnel is not, of course, shown on the map referred to. The new No. 3 tunnel is the old No. 2 tunnel and the new No. 4 tunnel is the old No. 3 tunnel. The new numbering will be adhered to in this and subsequent reports.

In the 1914 Annual Report a full account of the geology and vein system is given, which will not be herein repeated. Indeed, no great amount of underground development has taken place since that year. Last year No. 2 tunnel was advanced a distance of 63 feet from the surface and connected with No. 1 tunnel by a raise at the face of the former. This year a raise near the face of No. 4 tunnel has been run up to connect with No. 3 tunnel, which latter has been connected with No. 2 tunnel. The present position is, therefore, that all workings are connected underground, and No. 4 tunnel forms the main working-tunnel, with the upper terminal of the aerial tram at this level, likewise the main mine camp. Unfortunately very severe weather was experienced in the beginning of November before arrangements could be made to render available a supply of cooling-water for engine and air-compressor. It has therefore not been possible to operate compressed-air drills in the mine; consequently mining operations are being carried on by hand at present. Stoping operations and shipments were resumed in November. Until compressed air is available, when a more extensive development programme will be inaugurated, No. 2 tunnel only is being continued.

The elevations of the levels are as follows: No. 4 tunnel, 4,610 feet; No. 3 tunnel, 4,731.5 feet; No. 2 tunnel, 4,792 feet; No. 1 tunnel, 4,829 feet. The vein apexes on the surface at 4,959 feet, this being the lip of the basin.

An inspection of underground workings was made in July. At this time the face of No. 1 tunnel was approximately 160 feet farther into the mountain than the three lower tunnels, the faces of which were, roughly speaking, about in the same vertical plane. The back of No. 4 tunnel indicated possibilities of milling-ore above this level. No. 3 level showed in the floor a width of 10 inches of nice ore at one point. Close to the face ground had been stoped to a height of perhaps 30 feet and for about the same length. Just beyond this stope the level swings sharply to the east, evidently off the strike of the vein, which would appear likely to be recovered by continuing the drift on its former bearing. No. 2 level was at the time about 65 feet in length, and at 45 feet from the portal showed a width of about 1½ feet of nice ore on the hanging-wall, an interesting exposure. No. 1 level at the time had advanced a distance of 225 feet from the portal and showed some good ore near the face. It is stated that 90 tons of ore has been yielded by this level. On the surface, about 100 feet above No. 1 tunnel, an open-cut showed upwards of a foot in width of mixed zinc-blende and galena. Just above this point the vein is faulted about 15 feet to the west, and just above the point of faulting a width of 2 feet of mixed zinc-blende and quartz and galena shows. Since inspection the management advises that No. 2 tunnel has been advanced a further distance of 70 feet and that ore was continuous, varying from 5 to 18 inches in width. It seems evident that from the surface down to No. 2 tunnel, and quite possibly below this, considerable promise is indicated.

While the ore is bunchy and constantly offset by frequent recurrence of small faults, the throw of the latter is only a foot or so and the ore should not be difficult to follow. Mineralization is essentially zinc blende-galena-jamesonite of good silver content which lends itself to

hand-sorting. The hand-sorted ore assays from 80 to 100 oz. silver to the ton and from 20 to 30 per cent. lead. A topography conducive to cheap mining by adit drift-tunnels and comparative nearness to transportation are favourable features, and this property seems likely to well repay intelligent development. It seems also quite likely that the latter will afford warrant for the erection of a mill. (For further particulars of this property *see* the Annual Reports for 1914, 1925, and 1926.)

**Sunrise.** Work has been done on this property during the year by the Hazelton Sunrise Mines, Limited (L. W. Patmore, secretary, Prince Rupert). The mode of occurrence of the mineralization is very fully described in the Annual Reports for the years 1920 and 1924, the former of which contains a map. Further mention will also be found in the Annual Reports for the years 1923, 1925, and 1926.

At the time of inspection in September, at an elevation of 4,800 feet a crosscut tunnel 750 feet in length had been run, and from the end of this crosscut a raise was being run up, pitching at an angle of about 45° away from the portal of the tunnel. The crosscut, although not very straight, had been run on an average bearing of about S. 18° E. (mag.), the objective being to intercept the downward continuation of the more southerly of the two replacement shear-zones, which exist on this property, at a point directly below that at which a shaft had been previously sunk from the surface to a depth of 40 feet. (The shaft is now full of water.) The elevation of the collar of this shaft as determined by aneroid was 5,010 feet. The raise in question had been advanced a distance of 58 feet and a small amount of mineral showed in the back. Mining was being carried on by compressed-air drill operated by a small Sullivan portable compressor.

The shear-zone forming the objective presents a strong surface showing of mineral and strikes N. 67° E. (mag.), dipping southerly at a flat angle of about 25° away from the portal of the crosscut tunnel. Only an accurate survey can determine whether this crosscut has advanced far enough to penetrate the downward continuation of the shear-zone. There are, however, features which indicate that the value of the surface showing is not sensibly lessened by the negative results of crosscutting. In the first place, assuming the shear-zone continues downward on a pitch of 25°, the distance measured along the pitch from the *bottom* of the shaft to the point of interception by this crosscut would be about 460 feet. There is therefore still abundance of room for a large ore-shoot below the surface, even although the crosscut encountered no ore. Secondly, shear-zone replacement deposits, where barren, are extremely difficult to detect, and owing to their lack of wall definition are practically indistinguishable from the enclosing country-rock, hence are very apt not to be perceived in a crosscut. Thirdly, the surface indications of the mineralization rather point to the likelihood of the existence of ore-lenses whose major axes are more or less horizontal. If such is the case a further uncertainty is added to their development at depth by crosscutting. In considering what may best be done at the present juncture, it is suggested that an accurate survey of the workings be first made. If this demonstrates that the crosscutting has not been advanced far enough, then the latter might be continued, if the distance indicated is not material, to ascertain if the shear-zone is ore-bearing at this point. Whether crosscutting is continued or not, an obvious piece of development would appear to be that of continuing the shaft, which has already been sunk 40 feet with the bottom in good ore; refer to Annual Report for 1920. This shaft should be continued downwards as long as it keeps in ore for at least 100 feet from the collar and drifts run east and west at this level, or higher should ore pinch out. This should throw some light on the probable rake of the ore-shoot, the underlying idea being to develop from the surface downwards sufficient ore to warrant connection of the crosscut with the upper workings to facilitate extraction.

**American Boy.** A full description of the geology and vein system will be found in the Annual Reports for the years 1914 and 1917. Mention is also made in the Annual Report for 1926. This property is now under operation by Harris Mines, Limited. Work was started on September 1st with a few men, W. T. Parsons being in charge. Work comprised crosscutting from the bottom of the shaft previously sunk to the 300 foot level on the No. 3 vein to pick up the flattening vein. Late in December a flow of water was struck, presumably owing to cutting the vein, and there being no pump on the property, operations were temporarily suspended. Baling had hitherto sufficed to keep pace with the water.

*Slocan.*—The owner, J. Miller, reports that he mined between 12 and 15 tons of ore on this group, which he hopes to be able to ship next year.

*Four-mile Mountain.*

**Mohawk.** (Formerly named *Erie* group.) A description of this property will be found in the Annual Reports for 1914, 1920 (under *Erie* group), and 1925 (under *Mohawk* group). This property is distant 5 miles by road from New Hazelton Station on the Canadian National Railway. Development was resumed on December 1st by E. G. Brown, with D. A. Harris in charge of operations. After preliminary work in connection with erection of camp buildings to accommodate a small force of men, underground development was started towards the close of the year. This comprised continuation of the northward drift previously run from the shaft at a depth of about 40 feet from the surface. A promising strike of ore was reported in this working and it was to confirm such that a brief inspection was subsequently made. Owing to snow covering surface exposures a detailed examination is of necessity deferred until the coming season. Examination disclosed the following features:—

The face of the drift referred to, which had been advanced about 20 feet from the point of commencement, showed very encouraging appearances—a width of about 4 feet of ore of an essentially concentrating character, of which a width of about 2 feet was heavily mineralized with antimonial galena and zinc-blende, such as to permit of hand-sorting to shipping grade. Sorting was in progress at the time of inspection and several tons of ore had been sacked. A grab sample from a few sacks assayed: Gold, 0.06 oz. to the ton; silver, 72.8 oz. to the ton; lead, 17 per cent.; zinc, 19 per cent.

The lower portion of the face showed distinct evidence of faulting, with an eastward throw of a few feet, the dislocated portion having been recovered by a short crosscut run eastward for a short distance at the face.

The shaft appears to be sunk at a point where faulting of the north-easterly striking vein is at a maximum and possibly mineralization at a minimum. In any case the wisdom of following the ore disclosed northerly by drifting and downward by winzing at a suitable point is apparent. Such, coupled with a careful examination of surface exposures, will doubtless throw much light on general structure. It is also regarded as a matter of immediate necessity that an accurate transit survey of workings be made and map showing plan and section prepared therefrom.

It is understood to be the intention of the operators to install a small portable air-compressor in the near future for the purpose of operating a machine-drill in the mine. Present appearances augur well for the future and invite and justify intelligent development.

It is understood that there are certain favourable surface exposures on this property which could not be examined on this occasion owing to snow, but which will be investigated in 1928.

It is, however, evident that this property possesses favourable features, and it seems a reasonable expectation that intelligent development will ultimately disclose sufficient ore to justify the erection of a mill. In the meantime, it is a happy state of things that good silver values enable ore met with to be sorted by hand to shipping grade.

*Rocher Déboulé Mountain.*

So far as is known, operations on this mountain during the year were confined to the efforts of three indefatigable prospectors on their respective properties: J. Miller working on his *Brunswick* group (*see* Annual Reports for 1914, 1925, and 1926), John Creagh on the *Brian Boru* group (*see* Annual Reports for 1914 and 1926), and D. MacDonald on the *Black Pilot* and neighbouring claims (*see* Annual Report for 1926).

**Aurimont Gold Mines, Ltd.** (Formerly New Hazelton Gold-Cobalt Mines, Limited; *see* Annual Reports for 1925 and 1926.) The property of this company was inoperative during the year, but the following information is supplied by the company as to the ore shipped in 1926. This ore, 22 tons dry weight, was purchased by Associated Metals and Minerals Corporation, of 100 East Forty-second Street, New York, and shipped to reduction-works in Melbourne, Australia. Assay by Ledoux & Company was as follows: Gold, 4.65 oz. to the ton; arsenic, 42.3 per cent.; cobalt, 4.6 per cent. It is interesting to note that payment is received for all cobalt values in this ore at the rate of 1s. 10d. a pound of metallic cobalt, under the market quotations for cobalt ruling at the end of 1927.

It might also be mentioned that in 1919 a car-load of ore was shipped from this property to the Department of Mines, Ottawa, for testing purposes. While details of the mill test are

lacking, a table concentrate was made assaying: Gold, 7.20 oz. to the ton; molybdenum sulphide, 1.95 per cent.; cobalt, 5.65 per cent.; nickel, 3.65 per cent.; arsenic, 53.3 per cent.; and a flotation concentrate was made carrying up to 70.2 per cent. molybdenum sulphide.

For particulars of development at this property refer to Annual Report for 1925. Inspection has not been made since the development therein mentioned was carried out, but there appears to be no reason why operations should not with advantage be resumed in 1928, as the company has ascertained that an output of at least 30 to 50 tons of this ore monthly can be marketed on satisfactory terms.

*Thoen Basin.*

A full account of this region, dealing with geographic, topographic, and geologic features, will be found in the Annual Report for 1921. Matter therein contained will not be repeated, save to recapitulate very briefly that the Thoen basin is situated at the head of 31-Mile creek. This creek, a tributary of the Suskwa river, is crossed by the main trail from Hazelton to Babine lake at a point 31 miles from Hazelton. This year, with the aid of the Department of Mines, a new branch trail to the Thoen basin was constructed from the point where the main Hazelton–Babine trail crosses 29-Mile creek, shortening the distance from Hazelton by 2 miles. The length of this branch trail is about 3½ miles.

**True Fissure.** This group is owned by J. A. Rutherford and Gordon McLennan and work was done on it this year by the owners. The showings inspected are exposed on the steep walls of the basin and lie between elevations 5,170 and 5,900 feet above sea-level. They are probably all on the same vein, but this is not absolutely certain. It is stated that other more favourable showings exist at a greater elevation, but these, owing to snow, were inaccessible at the time of inspection in July. The exposures are of a shear-zone fissure, between 1 and 2 feet in width, in argillitic rock in the near vicinity of an intrusion of granitic rock. This fissure strikes about N. 50° E. (mag.) and dips at about 50° to the south-east, and appears to conform in strike and dip with the enclosing country-rock. It is well mineralized with galena, zinc-blende, and iron pyrites, and carries good silver values. The admixture of minerals is fairly intimate. At 5,170 feet a tunnel was run a few feet on a well-mineralized vein 10 inches in width, showing zinc-blende, a little galena, and pyrites. A sample across this width assayed: Gold, trace; silver, 54 oz. to the ton; lead, *nil;* zinc, 4 per cent. At 5,335 feet an open-cut exposes an interbedded vein, showing much the same width and character of mineralization as at 5,170 feet. A sample at this point across 10 inches assayed: Gold, trace; silver, 3 oz. to the ton; lead, *nil;* zinc, 6 per cent. At 5,845 feet a vein-width of upwards of 2 feet is exposed carrying a seam of ore 5 inches in width on the foot-wall and a seam of the same width on the hanging-wall. A sample taken of the ore only assayed: Gold, 0.02 oz. to the ton; silver, 26.6 oz. to the ton; lead, trace; zinc, 12 per cent. At 5,900 feet a vein is exposed by natural agencies of an average width of 1 foot, interbedded. A sample across this width assayed: Gold, 0.04 oz. to the ton; silver, 13 oz. to the ton; lead, 2 per cent.; zinc, 10 per cent.

The region is of general geologic promise. It might be pointed out that, while the Thoen basin is distant about 33 miles from Hazelton by trail, a shorter route to the railway could be rendered available should developments warrant such. A wagon-road down the Suskwa River bank to its mouth, about opposite Bulkley Canyon Station on the Canadian National Railway, and a cableway across the Bulkley river at this point, would materially improve the present transportation.

SMITHERS SECTION.

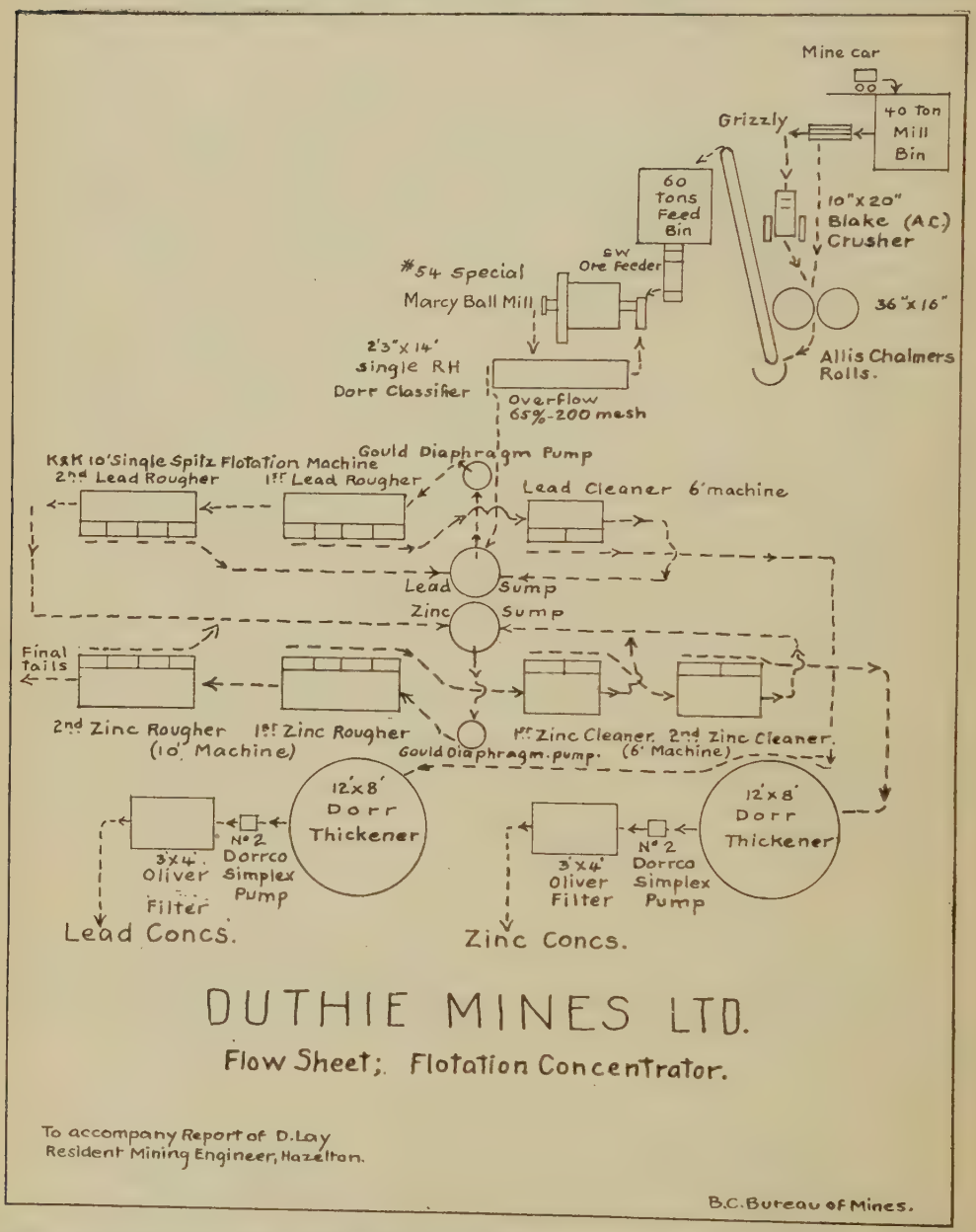
*Hudson Bay Mountain.*

Hudson Bay mountain was the scene of much activity throughout the year, notably on the part of Duthie Mines, Limited, at the *Henderson* mine. At this property a flotation concentrator of 50 tons daily capacity was constructed and put into highly successful operation and much underground development was accomplished. In November options were secured by John J. O'Brien on the *Victory* and *King Tut* groups and active development at both these properties was commenced. Mount Evelyn Mines, Limited, commenced small-scale operations at its property during the summer, which are to be continued throughout the winter. At various other properties small-scale operations were carried on by the owners concerned.

All important properties will be found fully described in the various Annual Reports of the Minister of Mines. In the Summary Report, 1925, Part A, of the Geological Survey, page 120, will be found a detailed account of the geology and ore-deposits by R. H. B. Jones.

**Henderson.**

Reference to the plan and flow-sheet herewith will greatly elucidate the text. An active development campaign was carried out by Duthie Mines, Limited, during the year, comprising the running of an adit-tunnel 680 feet in




length at the level of the mill ore-bin (elevation 3,325 feet) and an upraise therefrom connecting with the winze previously sunk from the Compressor level, the elevation of which is 3,588 feet. In addition crosscuts were run from the adit-tunnel to both Main and Fault Plane veins, drifts being started on both veins at this level. Extensive development in the Main vein was also undertaken on the Intermediate level (elevation 3,499 feet), where the vein was found to be

To accompany Report of D. Lay.
Resident Mining Engineer, Hazelton, 1927

B.C. Bureau of Mines.

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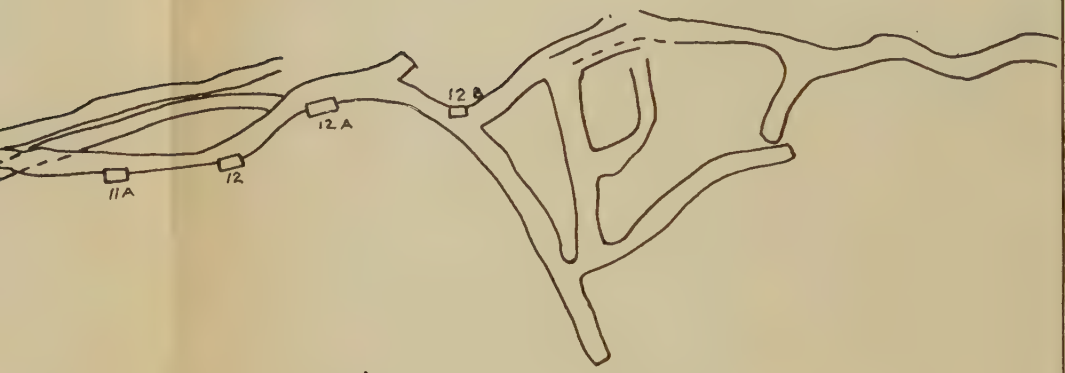
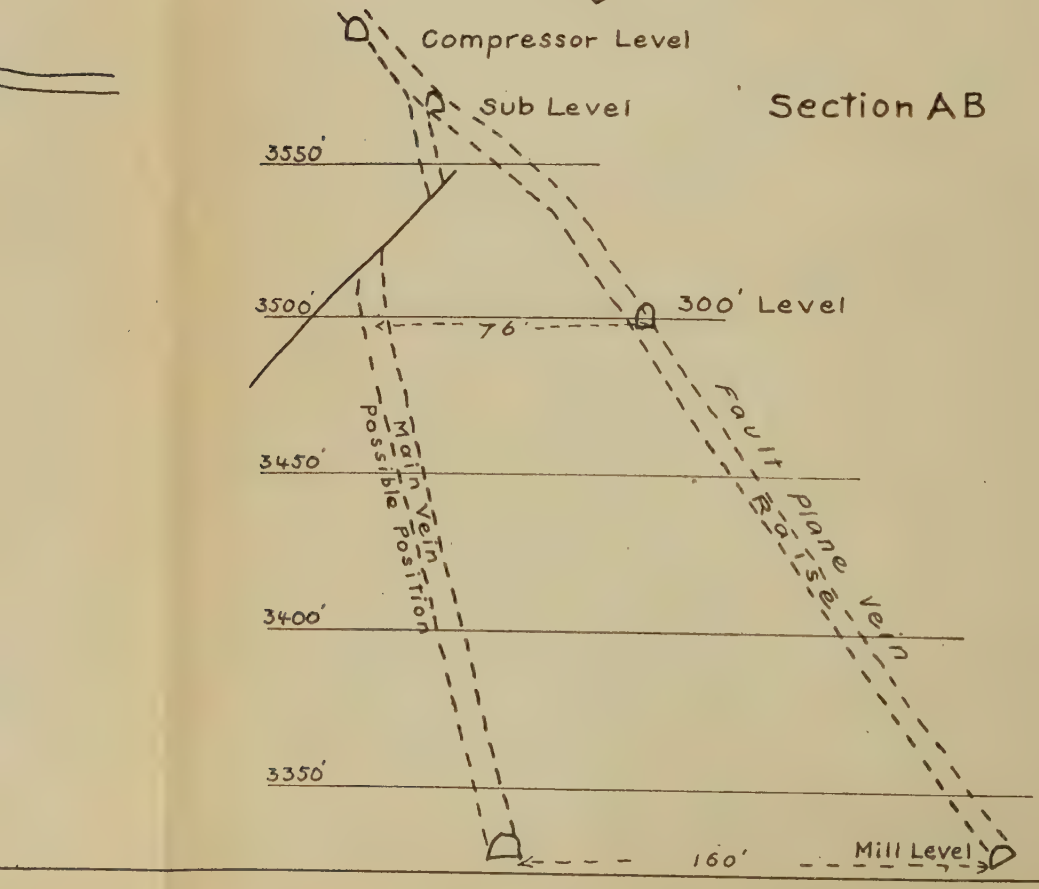


faulted westerly at this horizon, although productive of good ore on and above it. The main adit-tunnel passed through the Fault Plane vein at 216 feet from the portal and was continued as a crosscut until reaching the calculated point for the raise to connect with the upper workings. Crosscutting to the Main and Fault Plane veins disclosed good ore in both veins. In the latter vein was struck the richest ore yet found in this property.

In brief, the mode of occurrence in that portion of the property now under attack is that of two veins, the Main and the Fault Plane veins, which at the horizon of the Compressor level have their point of junction at or near No. 6 chute, north-east of which point they diverge. The Main vein is the foot-wall vein with steep dip; the Fault Plane vein is the hanging-wall vein with a much flatter dip. Both veins dip in the same direction; consequently they diverge also in depth.

The results of development to date have been most satisfactory and it is gratifying to record the marked improvement in this property during 1927. Two important results of development during the year are:—

(1.) The view that the ore-shoots followed the contour of the mountain-slope and would not be found far underground, which at one time seemed plausible, has been quite disproved.

(2.) The general high average silver grade of the Main vein has been well maintained in depth, and that of the Fault Plane vein has shown a very marked improvement.

The general nature of the mineral occurrence within the veins is "bunchy," but withal persistent. Under such conditions, when milling only a limited tonnage it is always a problem to maintain low mining costs. Low mining costs can only be secured by following shrinkage-mining methods, and such, although undoubtedly justified, do not lend themselves to ready rejection of low-grade ore which it may be necessary to break at times in stoping. On the other hand, the economics of the purely milling question necessitate a certain minimum grade of feed. In the case of this property, and many others, close co-ordination of mine and mill is essential, and this is a matter which is absorbing the closest attention of the management.

*Mill.*—Preliminary work in connection with foundations was commenced in April and actual milling operations started on July 13th. The plant was designed by the Southwestern Engineering Corporation, of Los Angeles, California. The "all flotation" flow-sheet embodies the latest principles of selective flotation. The nominal capacity is 50 tons in twenty-four hours. The motive power is steam, furnished by a 165-horse-power boiler operating a 150-horse-power engine. The fuel is wood, which is hauled from the place of cutting below the mill by a tram alongside the mill.

The flow-sheet supplies supplemental data as to circuit and machinery installed. From this it will be noted that lead concentrates are cleaned once and zinc concentrates twice.

It was found that the capacity of the plant with Dorr classifier overflowing at 65 per cent. minus 200-mesh, the required degree of fineness, was somewhat under 50 tons daily; consequently it was decided to replace the original 9- by 15-inch Blake crusher by a 10- by 20-inch crusher of the same type, and to interpose a set of 36- by 16-inch Allis-Chalmers rolls between crusher and ball-mill, which it is anticipated will increase capacity considerably. This change was in effect towards the end of the year as shown by the flow-sheet.

The ball-mill is a modified Marcy mill of the overflow type; 3-inch and 4-inch balls are used, obtained from Cammell, Laird & Co., Limited, Sheffield, England.

As far as possible mill products are sampled automatically. The mill is yet in the "tuning-up" stage and reagents are subject to constant change. While particulars are given of those in use in December, it should be borne in mind that it does not follow that these will be found the most suitable finally. Quantities given are in pounds to the ton of ore. Lead circuit: Potassium xanthate, 0.08 lb.; lime, 3.9 lb.; soda-ash, 0.25 lb.; sodium cyanide 0.46 lb.; zinc sulphate, 0.61 lb.; Barrett No. 4, 0.03 lb.; pine-oil, 0.04 lb.; cresylic acid, 0.19 lb. Zinc circuit: Potassium xanthate, 0.07 lb.; lime, 3.8 lb.; soda-ash, 0.13 lb.; copper sulphate, 0.74 lb.; pine-oil, 0.07 lb.

Of the lead-circuit reagents, lime, zinc sulphate, xanthate, and cyanide are added to the ball-mill. Pine-oil and Barrett No. 4 are added to the flotation-machines.

The grade of the feed in silver is generally high, although from the nature of the ore and limited tonnage treated wide fluctuations must occur. The following particulars are indicative of the results obtained to date, which are being constantly improved. These are highly informative and markedly good.

Particulars of milling operations from inception (July 13th) to December 31st:—

Ore milled, 5,500 tons (approximately), assaying: Silver, 37.2 oz. to the ton; lead, 4.8 per cent.; zinc, 5.2 per cent.

Lead concentrates produced, 358 tons, assaying: Gold, 0.27 oz. to the ton; silver, 430.8 oz. to the ton; lead, 48.6 per cent.; zinc, 10.9 per cent.

Zinc concentrates produced, 319 tons, assaying: Gold, 0.093 oz. to the ton; silver, 36 oz. to the ton; lead, under 1.4 per cent.; zinc, 47.2 per cent.

Savings effected: 95 per cent. of silver contents; 95 per cent. of lead contents; 80 per cent. of zinc contents.

It is to be noted that distinctly better results than the foregoing are now being obtained, lower tailings and better products. Entire confidence is expressed by the management in ability to effect still further improvements. The uniform excellence of the results achieved by flotation nowadays necessarily leads to judgment of metallurgical achievement by a high standard. Nevertheless, judged even by such severe standard, the results obtained in this mill are excellent. Adjoining the mill is a well-equipped assay office and testing laboratory, J. D. Boulding being assayer. The results of the year reflect great credit upon all concerned; upon John R. Turner, manager; and upon C. F. Hoff, mill superintendent.

The management kindly supplies the following interesting information relating to the production of this property: Prior to the commencement of milling operations this year a total of 4,788 tons of hand-sorted ore was shipped in previous years and to date, the gross smelter returns for which amounted to $523,744.92, leaving net smelter returns of $411,705.72, after deducting freight and treatment rates amounting to $23.40 a ton.

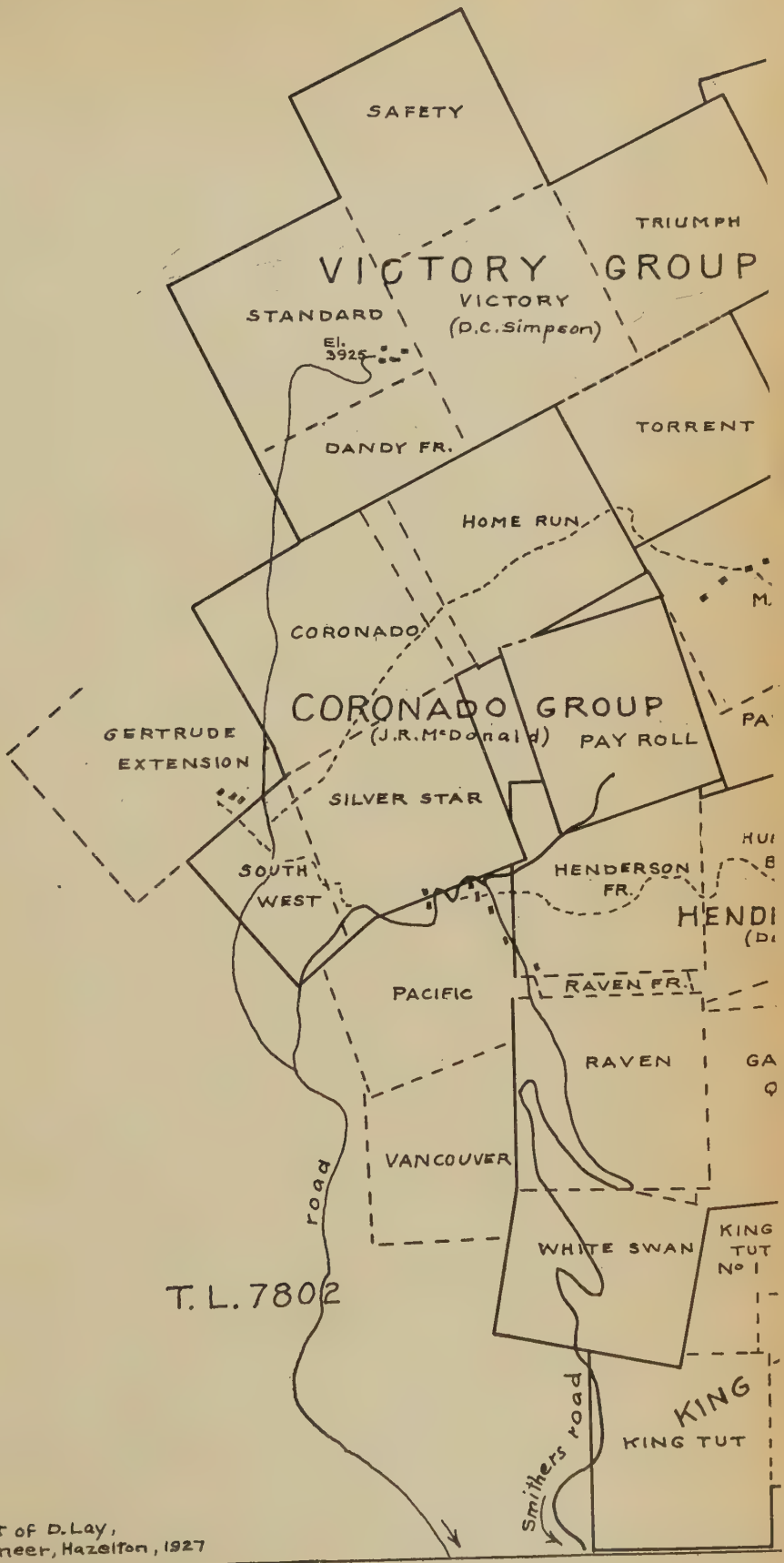
There is no doubt that for the past three years this property has been the backbone of the lode-mining industry in this section. Its successful operation has been, and still is, an incentive to others to embark upon the development of other properties. Unfortunately extremely severe weather commenced shortly after the end of October and has since been continuous. This had the effect of greatly curtailing wash-water supply and slowing down milling operations towards the close of the year. When, however, abundant water is available in spring it is anticipated that the capacity of the mill will closely approach 75 tons daily. Much further information concerning this property will be found in the Annual Reports for the years 1922, 1923, 1924, 1925, and 1926.

**Victory.** An option on this property, which is owned by Donald C. Simpson, was secured in November by John J. O'Brien, and a contract was let for 500 feet of drifting, which was commenced that month. It is understood that both No. 1 and No. 2 tunnels are to be driven ahead. In December the optionee's agent, F. H. Taylor, advised that at 71 feet from the portal a width of 4 feet 8 inches of ore showed in the face of No. 2 tunnel. A description of this property will be found in the Annual Reports for the years 1914, 1922, 1923, and 1925.

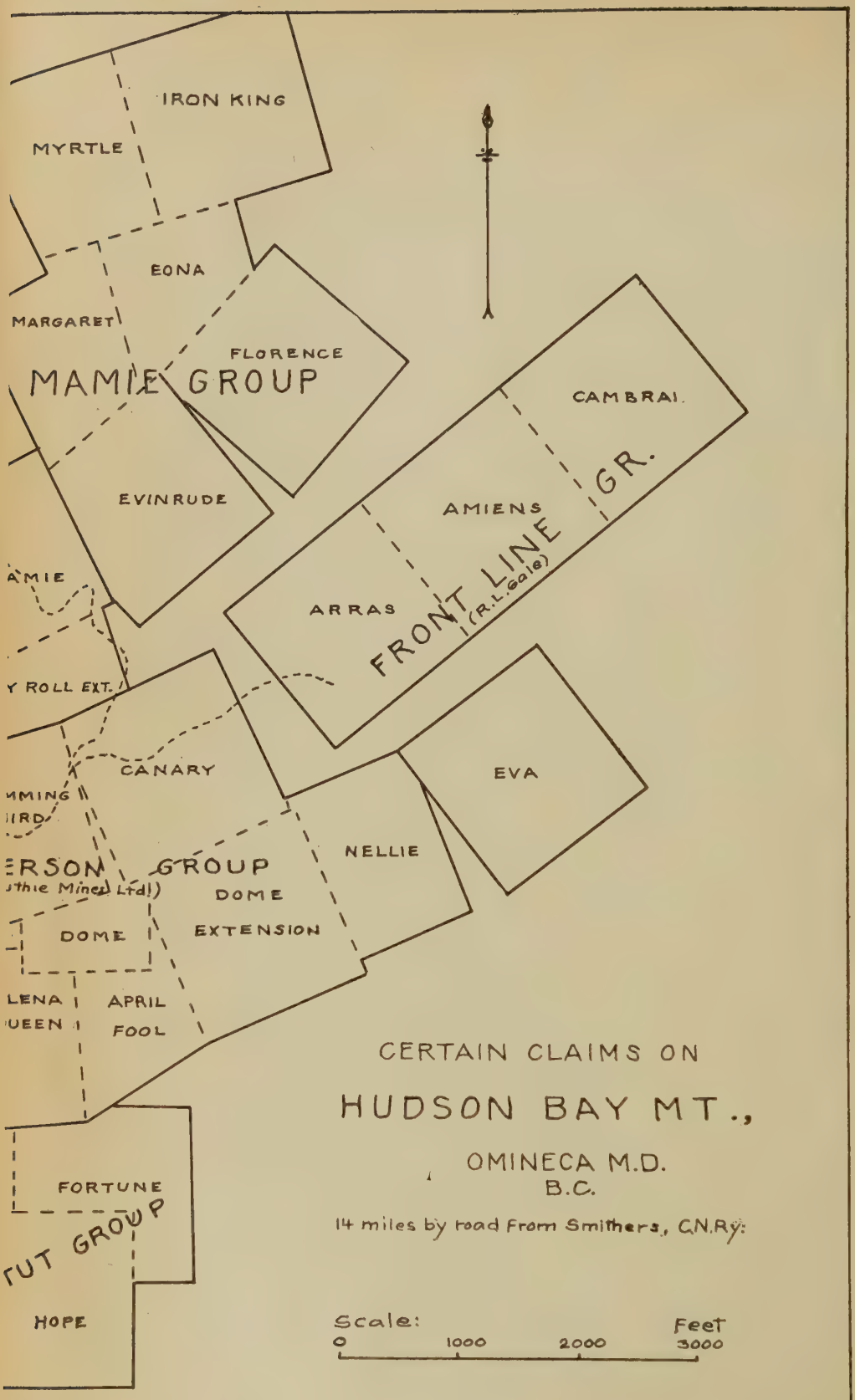
**King Tut.** This property was also taken under option by John J. O'Brien in November and a contract at once let for crosscutting and drifting. It is understood that it is the intention to do some 500 feet of tunnelling. A crosscut was started, which it is estimated will penetrate the vein at a depth of 140 feet (pitch distance) in a distance of 208 feet. Suitable camp buildings were also erected and an Ingersoll-Rand portable air-compressor installed. An account of this property will be found in the Annual Report for 1924.

**Mount Evelyn Mines, Ltd.** The property operated by this company, with certain additional claims, was formerly known as the Carroll property, and is described under that name in the Annual Report for 1917, page 114. The property was examined for the company by F. J. Crossland during the year, and upon his recommendation certain crosscut tunnels were commenced, which it is the intention to continue during the winter.

**Jessie.** This group is situated on a spur between the forks of Simpson creek at an elevation of about 4,300 feet. It is reached by a trail from the *Cascade* trail and is distant about 4½ miles from Smithers. At the time of inspection in June there was exposed at an elevation of 4,300 feet, by various open-cuts over a length of about 300 feet, a replacement fissure in the enclosing volcanic rocks. This strikes N. 30° W. (mag.) and dips westerly into the mountain at an angle varying from 30° to 60°. The vein is from 3 to 7 feet in width. Small seams of galena, zinc-blende, and arsenopyrite, with accompanying quartz, show at various points in the filling of silicified country-rock. Samples of selected




To accompany Report of D. Lay,
Resident Mining Engineer, Hazelton, 1927




CERTAIN CLAIMS ON

# HUDSON BAY MT.,

OMINECA M.D.
B.C.

14 miles by road From Smithers, C.N.Ry.

B.C. Bureau of Mines.

portions of mineral gave the following assays:—Sample of arsenopyrite: Gold, 0.74 oz. to the ton; silver, 1.06 oz. to the ton. Sample of galena and zinc-blende: Gold, 0.12 oz. to the ton; silver, 8 oz. to the ton; lead, 5 per cent.; zinc, 12 per cent.

The foregoing vein is known as "No. 2 vein." At the date of inspection there was also disclosed evidence of other branch veins, of which No. 3 vein exposed just above No. 2 vein appeared at the time to be the most important. This diverges from No. 2 vein at an angle of about 30°. The owner reports that since this inspection, at the junction of these two above-mentioned veins, a zone of mineralization 12 feet in width has been disclosed, of which a width of from 8 to 10 inches was good ore. It is further stated that five open-cuts were made on a vein known as "No. 5 vein," striking roughly at right angles to No. 2 vein, at a point distant westerly from the latter about 700 or 800 feet. The points of intersection of the members of this vein system would appear to be promising places for investigation.

*Mamie.*—For description refer to Annual Reports for the years 1917, 1919, 1921, 1922, and 1923. This property was examined by representatives of mining companies during the year.

*Canadian Citizen.*—For description refer to Annual Reports for the years 1925 and 1926. The owner reports that as the result of development during the year a new vein was uncovered over a length of about 60 feet and the width was from 3½ to 4 feet.

**Zobnic.** This group of two claims, owned by Alex. Zobnic, is situated about 1½ miles from Smithers and is distant a few hundred yards only from the *Empire* trail. At an elevation of 1,810 feet, in the left bank of an unnamed creek, a tunnel is run 20 feet on a bearing S. 75° W. (mag.), following a very sparsely mineralized shear-zone in andesite, dipping at 60° south-easterly. Assay of a sample yielded only traces of metals. Very small amounts of galena, zinc-blende, and iron pyrites can be perceived in places. Immediately beyond the tunnel occur two other small mineralized seams, apparently parallel to one another and striking N. 75° W. (mag.). One of these is exposed by open-cut at about 30 feet above the tunnel and the other at 100 feet above the tunnel is stripped for about 40 feet. Both show copper-stains and the latter evidently contains some grey copper. A sample of mineral picked from this seam assayed: Gold, trace; silver, 104 oz. to the ton; copper, 1.5 per cent. Further work on this seam is warranted. It would appear that this seam is likely to be exposed in the bank at the level of the creek and it might be looked for at that point.

**Glacier Gulch.** Further work in the form of surface exposures was done at this property by the owners. A description of the property will be found in the Annual Report for 1926. The occurrence is that of a silicified replacement following the bedding-planes of the enclosing volcanics. Although bunches of mineral occur here and there, the mineralizaion is on the whole rather sparse, but the high silver grade invites further work. A sample of selected mineral taken at the time of inspection in June assayed: Gold, 0.02 oz. to the ton; silver, 92.5 oz. to the ton; lead, 28 per cent.; zinc, 34 per cent. Further work was done after inspection and it is understood that some mineral was struck showing very much higher silver values than the above sample.

**Schufer.** For description refer to Annual Reports for the years 1916, 1918, and 1926. Beyond assessment-work on un-Crown-granted claims no work was done on this property during the year. While the option held last year by the British Canadian Silver Corporation was relinquished, it is pointed out that a promising body of ore was struck by this company in No. 3 tunnel late in the fall of 1926, just at a time when operations would in any case have had to be suspended for the winter. The following assay returns were furnished the owners by the British Canadian Silver Corporation:—A sample over 5 feet of mineralized zone assayed: Gold, 0.05 oz. to the ton; silver, 13.3 oz. to the ton; lead, 4.3 per cent.; zinc, 7.2 per cent. A sample over 5 feet in the back assayed: Gold, 0.10 oz. to the ton; silver, 18.2 oz. to the ton; lead, 2.1 per cent.; zinc, 5.3 per cent.

**Silver Lake.** A description of this property will be found in the Annual Report for 1926. The owners, L. S. McGill and P. Schufer, report that as the result of further work this year the vein was found at one point to be 15 feet in width, containing three seams of galena, one on each wall and one in the centre, the total width of the three seams being from 3½ to 4 feet, the vein-filling between the seams of galena being barren or nearly so. It is the intention of the owners to do a considerable amount of work on this property in 1928.

Liberal assistance was given during the year by the Department of Mines to the road from Smithers to Hudson Bay mountain, known as the "Duthie Mines road."

*Driftwood Creek.*

Very little activity took place in this section during the year.

*Carr (or Canyon) Creek.*

**Cimbria.** This group, owned by A. Elmstead, is situated on the right bank of an unnamed creek which flows into Carr creek. The latter rises in a low pass in the Babine mountains and flows into the Bulkley river. The property is distant from Smithers by road and trail about 20 miles and lies about N. 80° E. from Smithers. A car can be taken as far as Macdonald's ranch on the Cronin road, about half-way. At a point on the latter road about 3½ miles beyond Macdonald's ranch a trail leaves the road, swinging in a northerly direction to the property.

A good cabin has been built by the owner at an elevation of 3,700 feet close to the main workings. The latter consist of two crosscut tunnels, close to one another and at points 65 feet apart vertically. The lower is run at an elevation of 3,775 feet and the upper at an elevation of 3,840 feet; the bearing of both is much the same—that is, N. 55° W. (mag.); the length of the lower is 165 feet and that of the upper 50 feet. The objective of both is the same, that of the probing of a wide belt of very slightly mineralized granitic rock intrusive into the volcanics. This belt trends about N. 35° E. (mag.) and outcrops at a point about 1,000 feet south-west of the tunnels, and can be traced at intervals for a distance of upwards of 6,000 feet in a north-easterly direction from this point.

The mineralization, which is very sparse, consists of iron pyrites and a little copper-stain. Samples taken in the tunnels and at various points of the outcrops showed no values beyond traces and no hopeful commercial possibilities are evident. One point, however, is worth noting. At about 2,000 feet north-east of the tunnels, at an elevation of 4,330 feet, the granitic rock is overlain by a bed of limonite about 5 feet in thickness, evidently of recent origin by reason of the limonitized twigs and leaves present. This would suggest the possibility of the existence of a sulphide body in the rock somewhere above this point. It might be mentioned that the granitic rock appears to be a biotite granite and that the outcrops lie between elevations of 3,700 and 5,500 feet.

TELKWA SECTION.

*Grouse Mountain.*

**Cassiar Crown.** This property is owned by the Cassiar Crown Mining Company (formerly Cassiar Crown Copper Company) and descriptions of it will be found in the Annual Reports for the years 1916, 1917, 1920, and 1926. Operations were carried on throughout the winter of 1926 to 1927 and finally suspended indefinitely in the early summer of this year.

Referring to the map in the 1926 Annual Report, the work done comprised connecting No. 2 level with No. 1 level by a raise and crosscutting at various points on No. 2 level. The result of this development was to indicate that the promising shoot of zinc blende-chalcopyrite ore, previously exposed by No. 1 level, was, in effect, a lens whose major axis was horizontal, or nearly so, greatly exceeding the length of the minor axis. The downward extension of ore below No. 1 level was found to be only about 10 feet.

Among prospectors who did assessment-work on their respective properties on Grouse mountain may be mentioned: L. H. McLean on the *Rainstorm* group (*see* 1926 Annual Report) and *Black Fox* group (*see* 1925 Annual Report); J. Oakes on the *Cornu Copia* group (*see* 1925 Annual Report); and W. Skelhorne on the *Hidden Treasure* group.

*Mineral Hill.*

A brief description of the geological features will be found in the Annual Report for 1926.

**Butte.** This group of six claims, owned by J. Bussinger, is situated on the south slopes of Mineral hill. On the *Enterprise* claim of this group, at an elevation of 3,450 feet in an andesitic schistose rock, there is exposed by open-cut a vein 3 feet in width, striking north and south (mag.) and dipping easterly. Small amounts of galena, iron pyrites, and siderite can be perceived. Assay of a sample showed only traces of metals.

A few hundred feet west of the above exposure, at about the same elevation, quartz porphyry, in places pegmatitic, outcrops prominently. At one point quartz veinlets occur over a width of about 3 feet, showing a small amount of galena and copper-stain. A sample taken across this

width assayed: Gold, trace; silver, 2.8 oz. to the ton; lead, *nil*. Another sample taken over a length of 35 feet showed no values. About 500 feet west of this point a tunnel, run some years ago, follows for about 50 feet a brecciated sheared zone in the quartz-porphyry pegmatite without disclosing any mineral of importance.

The other showings on this property occur at the base of the slopes between Mineral hill and Grouse mountain at an elevation of 2,850 feet. Various open-cuts in an east-and-west (magnetic) direction expose quartz replacement fissures in andesitic country-rock. Mineralization is very sparse and consists of mainly iron pyrites, molybdenite, and a little copper-stain. Assay of a sample taken of the more heavily mineralized portion of ore-exposure showed no values in precious metals.

*Deposit of Travertine.*

A deposit of travertine, or calcareous tufa, was examined. This is owned by F. B. Chettleburgh and is distant about 1½ miles south-east of Telkwa and about 2 miles north of Hubert, close to an agricultural section of land. The main exposure occurs in the immediate vicinity of a spring at the base of a hill and results from the action of carbonated waters on lime-bearing rocks. This deposit is said to show on analysis a high lime content and to be excellent for agricultural purposes. The deposit is not being mined at present, and although exposures are inadequate to form an idea of its extent, a fair tonnage seems likely to be available. Similar smaller deposits occur in the vicinity and have been noted at various points throughout this Mineral Survey District. This particular deposit is well situated so far as transportation facilities are concerned.

**Red Dyke and Grey Dyke.** These claims, owned by Chisholm & Blythman, are situated on a low ridge only a short distance from the above-described travertine-deposit. In andesitic fossiliferous water-lain tuffs there is exposed in one or two places rhyolite (or it might also be a quartz-porphyry dyke intrusive into the tuffs; exposures are inadequate to determine this point) slightly mineralized with iron pyrites. A sample assayed: Gold, trace; silver, 1 oz. to the ton.

*Telkwa River.*

Time did not permit of visiting this section. The chief properties are the *Big Four* group, owned by Alex. Chisholm (*see* Annual Reeports for 1914, 1917, 1920, and 1926), and the *Kitchener* group, owned by Goodwill, Gillespie & Wilson, a description of which appears in the 1925 Annual Report.

An account of the geology and mineral-deposits of the Telkwa section will also be found in the following publications of the Geological Survey: "Telkwa River and Vicinity," memoir by W. W. Leach; Summary Report for 1915, page 62, by J. D. MacKenzie.

HOUSTON SECTION.

The most important properties in this section are those in the Owen Lake region—namely, the *Silver Queen* group, owned by H. C. Wrinch (*see* Annual Reports for the years 1916, 1923, 1924, and 1925), and *Diamond Belle* group, owned by J. Cole (*see* Annual Reports for the years 1916, 1923, and 1925). The owner of the *Diamond Belle* has done work on his property during the year and reports promising results. The surrounding geology is favourable for ore-deposition and these properties merit investigation by examining engineers.

The *Alma*, *M. Wood*, and *Solad* groups are all owned by Paul Tickolees and are situated between 5 and 6 miles east of Houston. A trail leaves the main highway at about 4 miles east of Houston and swings in a northerly direction to the properties.

**Alma.** This group consists of three claims. At an elevation of 2,685 feet on the banks of an unnamed creek flowing into the Bulkley river an open-cut exposes altered volcanic breccia country-rock striking N. 50° W. (mag.) and dipping north-easterly. A width of upwards of 30 feet is very sparsely mineralized with specks of galena and a little copper-stain. Assay of a sample of this rock gave the following results: Gold, trace; silver, 0.2 oz. to the ton.

**M. Wood.** This group also consists of three claims and adjoins the *Alma* group. At an elevation of 3,000 feet a sparsely mineralized seam, 3 feet in width in the volcanics, is exposed by open-cut. A sample of this seam assayed: Gold, trace; silver, 0.8 oz. to the ton.

**Solad.** This claim lies above the *M. Wood* group. At an elevation of 3,450 feet a copper-stained seam 1½ feet in width is exposed in the volcanics. A sample of this assayed: Gold, trace; silver, 2 oz. to the ton. At 3,600 feet elevation a stringer of galena and zinc-blende 3 inches in width shows, a sample of which assayed: Gold, trace; silver, 3.2 oz. to the ton; lead, 38 per cent.; zinc, 34 per cent.

**Bellicini.** This group consists of six claims, owned by E. G. Bellicini, situated on Buck river, distant about 1 mile in a southerly direction from Houston. Buck river cuts down somewhat deeply at this point through the prevailing volcanics, the left bank being about 150 feet in height, exposing beds of rhyolite. These strike N. 15° W. (mag.) and dip at about 50° north-easterly. A brecciated bed at the river-level shows specks of galena and a small amount of iron pyrites. A sample of the most heavily mineralized portion assayed: Gold, trace; silver, 0.4 oz. to the ton.

**Buck.** This group, owned by J. Carter, J. Quinn, W. Raymond, and T. Rush, is situated on the right bank of Buck river, at the mouth of Bob creek, and is distant about 8 miles from Houston. The main road from Houston to Wistaria passes within a quarter of a mile of the property. On the right bank of the river there is exposed evidence of a replacement zone in the highly altered purple-coloured volcanic breccia. This appears to strike about N. 75° E. (mag.) and to dip north-westerly. Small seams of galena and zinc-blende occur in the face of a tunnel which has been started just above the level of the river and which at the time of inspection had advanced a distance of 8 feet, following the zone into the bank of the river. The width of the zone is not apparent from exposures. While mineralization is at present sparse, it is worth following as silver values are hopeful. A sample of selected mineral assayed: Gold, trace; silver, 42.5 oz. to the ton; lead, 7 per cent.; zinc, 7 per cent.

"*Porphyry Dyke*" *on Bob Creek.*—A full account of a belt of rocks on Bob creek, known locally as a "porphyry dyke," will be found in the Annual Report for 1916, page 127.

### Topley Section.

A general account of the topographic and geologic features of this and neighbouring portions of the Nechako plateau will be found under "Prospecting" in the Annual Report for 1926.

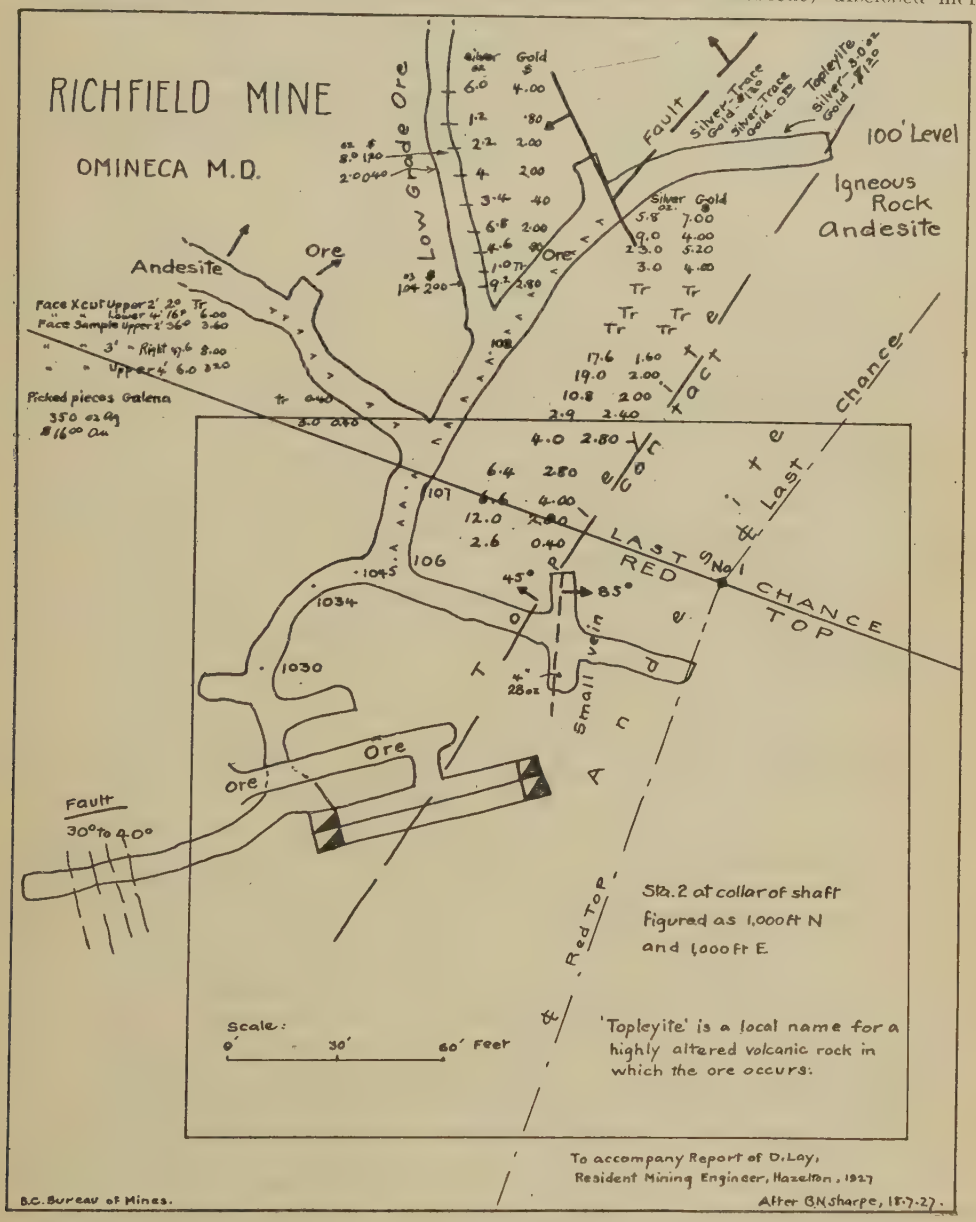
**Richfield.** This group, which was formerly named the *Red Top* group, is owned by F. H. Taylor and partner. The option on the property, held by the Standard Silver-Lead Mining Company, was relinquished in July, after that company had sunk 100 feet on the incline of 55° from the surface and carried out approximately 600 feet of tunnelling on the 100-foot level.

The property thereafter remained inoperative until the fall of 1927, when F. H. Taylor organized the Topley-Richfield Mining Company, Limited, for its development. The latter company, of which F. H. Taylor is manager, tackled the work in hand in an energetic and miner-like way. The first step was to install a 50-horse-power Vickers-Petter oil-engine running a 10- by 10-inch Ingersoll-Rand air-compressor, a 5- by 5-inch Anaconda air-hoist, and a Cameron sinking-pump. The power plant is housed in a 20- by 40-foot engine-room. The mine was unwatered by the end of November and the shaft sunk a further 20 feet to afford a good sump and pocket below the 100-foot level. With this slight addition, the assay plan of the Standard Silver-Lead Mining Company, published herein, represents the underground workings as existing in the latter part of December, when an inspection was made by the Resident Engineer.

Inasmuch as the Standard Silver-Lead Mining Company had left with the owners its assay plan, and, further, J. M. Turnbull having just completed an examination at the request of the owners, it was unnecessary to duplicate an already exhaustive sampling. Inspection therefore was made for the purpose of ascertaining the results of development during the year based upon available assays.

J. M. Turnbull's report is published herein in full. Apart altogether from the weight attached to the report of such a well-known engineer, the results of his samples studied in conjunction with those of the Standard Silver-Lead Mining Company are particularly informative. He sampled the mineralized bands only, whereas it is clear from the assay plan of the Standard Silver-Lead Mining Company that in the latter case samples were taken across the entire face of the tunnel, except in two or three instances, where the contrary is indicated.

An account of what was actually disclosed by development seems advisable: More often than not the unexpected happens in mining, and in the initial stages of development the Standard Silver-Lead Mining Company encountered the unexpected in failure to find any material amount of ore in the shaft from the level of the original crosscut downwards or in the 100-foot level immediately below this crosscut. (The floor of the latter is just 50 feet on a 55° pitch above the 100-foot level.) A long crosscut west (known as 1 W. crosscut) disclosed merely




"topleyite" and an extensive fault-zone. ("Topleyite" is the provisional name given to the characteristic highly altered rock in which the mineralization occurs and which is fully described in the 1926 Annual Report.) From the bottom of the shaft northwards the workings disclose essentially a number of mineralized, somewhat flat-lying, bands in topleyite. These bands differ in strike and dip, but there is a general tendency to strike more or less parallel to the andesite-topleyite contact and to dip with the latter north-westerly. A somewhat complex

structure is further complicated by a number of faults, the exact effect of any one of which is yet unknown. For the reasons just given, while the main 100-foot level follows the general strike, the so-called crosscuts 3 W. and 4 W. are in reality drifts following bands exhibiting a north-west strike and a north-east dip. Tunnels driven off the main level are referred to as 1 W., 2 W., 3 W., 4 W., and 5 W. on the west side, and as 1 E. and 2 E. on the east side, numbering them from the shaft northwards.

To describe briefly the individual bands (these are numbered purely for convenience of description and are not so numbered by the company or in J. M. Turnbull's report) :—

*Band No. 1* appears as a flat seam just north of the shaft, disappearing westerly in the floor of 2 W. crosscut and easterly in the back of 2 E. crosscut. The most heavily mineralized portions of this band are represented by J. M. Turnbull's samples 45 to 50.

*Band No. 2* appears just beyond 2 E. crosscut in the main level, at which point it dips somewhat steeply into the west wall of the level. It is represented by J. M. Turnbull's samples 37 to 40.

*Band No. 3.*—In the region of the portal of 3 W. crosscut the north-west strike and north-east dip become apparent. Such features characterize band No. 3, which develops in the main level at this point and is followed by 3 W. crosscut for about 40 feet, when it disappears in the floor. This band is represented by J. M. Turnbull's samples 15 to 24.

*Band No. 4* develops in 3 W. crosscut in the back immediately following band No. 3. This band dips north-east at a somewhat flat angle and is represented by J. M. Turnbull's samples 54 to 60. These two bands occur tandem-fashion and are considered jointly by Professor Turnbull in his computations. Band No. 4 exhibits the best showing of ore in the mine. Width where exposed is about 6 feet.

*Band No. 5* develops in the main 100-foot level just beyond portal of 3 W. crosscut and its north-westerly strike is followed by crosscut 4 W. for about 30 feet, when the tunnel apparently swings away from the band. This band is represented by J. M. Turnbull's samples 32 to 36.

*Band No. 6* develops in 4 W. crosscut ahead of band No. 4, but is not as well mineralized as the latter. It also dips north-easterly.

*Band No. 7* develops in the main 100-foot level just beyond the portal of 4 W. crosscut and is exposed as a strong well-mineralized band dipping north-westerly in the west wall of the main level from point of development to the faulted region shown on map. This band is represented by J. M. Turnbull's samples 7 to 14.

Ahead of band No. 7, beyond the faulted region, the 100-foot level passes apparently diagonally through a sparsely mineralized sheeted region to the topleyite-andesite contact.

Reviewing certain aspects of the property as they appeared originally, and as they now appear in the light of recent development:—

(1.) *Tonnage and Values.*—Referring to the Annual Report for 1926 (under *Red Top* group), it will be seen that such meagre data as were then available indicated the possibility of the existence of a banded replacement mineralization of magnitude such as to constitute a large low-grade milling proposition of a grade certainly not exceeding that yielded by the sample taken across 23 feet in the crosscut tunnel and assaying: Gold, 0.13 oz. to the ton; silver, 7.8 oz. to the ton (a gross value of $7.05 a ton with silver at 57 cents). The question of mining individual bands seemed then of minor importance. At any rate, nothing seemed more likely than that, assuming development justified early hopes, a large capital outlay would be involved in mining and milling plant adequate to cope with such low-grade ore before any returns on the investment would be forthcoming. It is interesting to recall that when the original tunnel was in a distance of about 30 feet, from the much more meagre data then available an engineer and the writer discussed possibilities and developments generally on a basis of an ore running between $6.50 and $7 a ton. Turning to the assays of the Standard Silver-Lead Mining Company (which, as mentioned, the assay plan shows were taken across the full width of the tunnel, save in one or two instances) : Nineteen samples taken in the main 100-foot level from survey station 106 onwards to the face, a distance of 180 feet, give, including blanks, an arithmetic mean of: Gold, $2.32; silver, 6.6 oz. The arithmetic mean of nineteen samples taken in 3 W. crosscut and 4 W. crosscut is: Gold $2.10 to the ton; silver, 8.4 oz. to the ton. The arithmetic mean of all these samples being: Gold, $2.21 to the ton; silver, 7.5 oz. to the ton; which would appear to represent the grade of the muck resulting from the tunnels in the regions of the best bands and which agrees fairly closely with sampling in the original crosscut tunnel, and even

earlier ideas. It is not at present possible to hazard even an intelligent guess as to the likely tonnage of material of such grade. The result of recent development has been to emphasize the importance of individual bands and to suggest that profitable comparatively small-scale operations may result from mining individual bands. But it is quite problematical, in the present state of development, whether the economics of the question will call for the mining of a number of individual bands or for the mining of a large block of ground containing a number of such bands. The outlook certainly appears more favourable for comparatively small capital than formerly, and further development is clearly warranted.

(2.) The main contact of the andesite and topleyite, striking about N. 30° E., appears underground much nearer the shaft than such surface observations as were possible indicated. The andesite on the surface is of pronounced porphyritic structure. Time did not permit of a close examination of underground specimens, but these should be compared with surface exposures. It is possible that more topleyite exists between the andesite underground and that forming the flanks of Black mountain.

(3.) *As to Topleyite.*—From field observations at a number of different points on the Nechako plateau, andesite has been observed blending into a highly altered rock closely resembling topleyite, which inclines the belief that topleyite is altered andesite. This raises the question as to whether the mineralization is not likely to have followed the bedding-planes of the original andesite, and therefore the mineralization in topleyite to exhibit this trend, which would be changed locally by faulting.

(4.) In connection with the mineralization in unaltered andesite as exemplified in 2 E. crosscut and the shaft-sump, it might be mentioned that some 800 feet north-east of the shaft a vein in the andesite showing mineral was one of the early discoveries. Some work at this point in the future might be advisable.

(5.) In regard to diamond-drilling, while development discloses more unfavourable ground for diamond-drilling than was apparent on the surface, nevertheless the experience of the writer with diamond-drilling in the Slocan leads to the belief that it should be tried at this property. If this method of exploration cannot be adopted and recourse must be had entirely to excavational development, then structure-revealing operations must be slowed down enormously. It would appear advisable to decide this point one way or the other soon. Diamond-drill data will call for carefully studied interpretation.

(6.) Reverting to the question of immediate excavational development, there are several points of obviously hopeful attack. One of the most important appears to be a drift following band No. 4 north-westerly, and from the end of such drift a vertical raise to the surface would, it is hoped, throw light on structure and incidentally furnish ventilation and another mode of exit and entry.

A sample was taken in 3 W. crosscut from roof to floor, a height of 6 feet 9 inches, at the point of commencement of the proposed drift following band No. 4 north-westerly. This sample assayed: Gold, 0.20 oz. to the ton; silver, 6 oz. to the ton; lead, trace; zinc, trace. While values appear to be spotty at this point, such assay might give some kind of idea of the value of the entire ground broken by this drift at the start.

(7.) Assuming that milling tests indicate no treatment difficulty, the high concentration ratio is undoubtedly to be regarded as a distinctly favourable feature of this property.

As a matter of general interest, the following figures are furnished by the manager as to oil required for the Vickers-Petter engine: Consumption of fuel-oil is about 2 gallons an hour, and the cost of the oil about 20 cents a gallon laid down at the mine.

Following is the report of J. M. Turnbull on the *Richfield* group and letter to the company accompanying his report:—

"December 26th, 1927.

"*The Topley-Richfield Mining Co., Ltd.,*
*P.O. Box 134, Smithers, B.C.*

"GENTLEMEN,—I spent four full days examining the Richfield mine, from December 15th to December 19th, 1927. I took sixty samples from the underground workings. The positions and assays of these samples are shown on the attached plan, which forms an essential part of the attached report. Certain geological features are also noted on the plan.

"Owing to snow I was unable to see anything on the surface, except the plant, but, as information was available from reports or letters of a number of reliable engineers in regard to surface workings and assays, this drawback was not very serious.

"I did not investigate your titles nor your claim areas, but satisfied myself from an inspection of your claim plans that the showings are amply protected in regard to extensions for a long time to come.

"The following points are covered in the report: Conclusions, page (1); values, page (1); treatment and transportation, page (2); ore-bodies, page (2); geology, page (3); development, page (4); diamond-drilling, page (5); plant and equipment, page (5); power, page (5); general conditions, page (5).

"Trusting that these points will cover what you require, the whole is respectfully submitted.

"Yours faithfully,

"J. M. Turnbull,
*Mining Engineer.*"

"*Report of John M. Turnbull.*

"*Conclusions.*—Assuming a satisfactory treatment method, your chief problem becomes that of development of adequate ore reserves. Summarizing briefly, I believe that the possibilities are favourable enough in regard to treatment and development to warrant the expenditure of enough money to carry out the necessary treatment tests and to develop the ground enough to prove its possibilities. That is to say, the possibilities warrant the risking of a further preliminary expenditure of say $25,000 to $50,000 in development. My chief reasons are as follows:—

"(1.) General magnitude of shearing and intensity of alteration indicate mineralization on a large scale. Geological conditions are favourable. Large ore-bodies are therefore possible.

"(2.) Development has not progressed far, but already indicates a wide mineral-zone; 250 feet along the ore-zone by 100 feet in width on the 100-foot level, partially developed only, constitutes the main development at present. The possibilities are therefore largely untouched yet and offer a chance of large size.

"(3.) The ground now developed happens to be in a section badly broken by faults and is therefore unfavourable for continuous ore-bodies. There is an excellent chance of great improvement in this regard and of better definition as development proceeds.

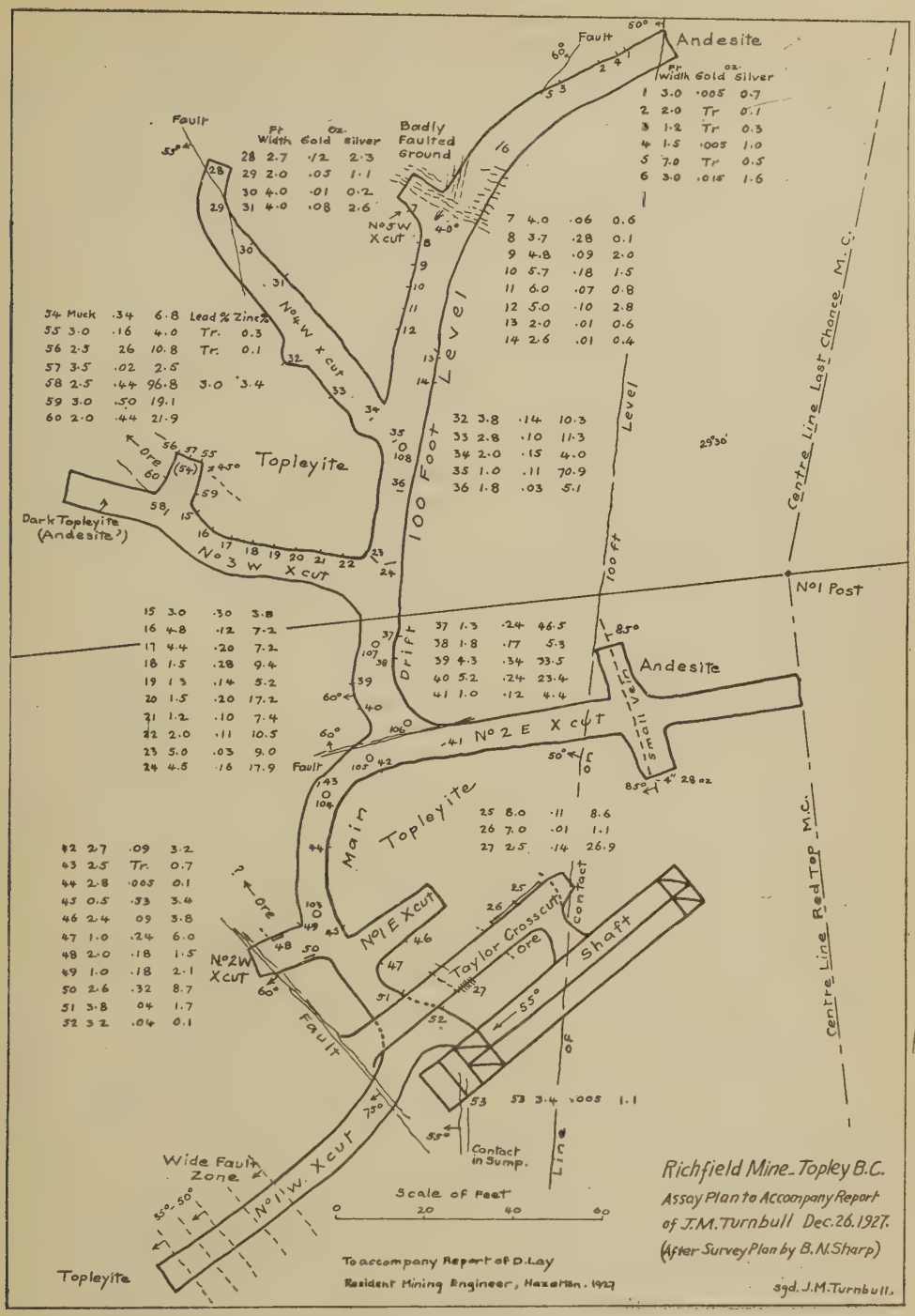
"(4.) Although even the known ore-bodies have not yet been fully followed out, the three best showings alone, in this broken ground, and only as far as followed, show up a tonnage of approximately 30 tons of $13 ore per foot of depth.

"(5.) In the bottom of the shaft the ore appears to be entering the foot-wall andesite formation. While low grade, this opens up an unknown possibility in a different formation. In fact, no definite limits have yet been found to ore-deposition on surface or underground. A small well-defined vein occurs in the andesite in No. 2 E. crosscut, showing that this formation may have interesting possibilities. The vein has good values.

"(6.) While the showings are somewhat confusing to develop at present, a rapid increase in efficiency of development will take place as the structure becomes better defined, so the cost of development is not likely to prove excessive.

"*Values.*—The chief element of doubt appears to lie in values rather than in tonnage. It is impossible to predict mining, milling, and development costs at present with any accuracy. The lower the workable values the greater the available tonnage, and vice versa. Extremely low costs are not indicated, but there is a fair supposition that a balance may be found at not over $7 per ton, based on 200 to 300 tons per day of production. Subject to correction, particularly from the results of treatment tests, this may be taken as a tentative line between ore and waste in figuring development results.

"There is no strong evidence of appreciable decrease in values due to depth. Secondary enrichment seems to be largely confined to a shallow surface zone. I think the chance of continuity of values is worth the risk, though the average grade may eventually prove too low, over a reasonably large tonnage, to make a large mine. In this case there will remain the possibility of smaller profits, working the better sections on a smaller scale, so that in any event there should be a considerable return on the investment ultimately.




"The margin is, however, not large enough to cover inefficiency or extravagance and good management will be a very essential factor in success.

"In addition to gold and silver, there will be a small amount of lead and zinc to recover. The gold and silver are the essential values and, not being in constant proportion, may be associated with different minerals, which may give rise to treatment difficulties and complexities.

It is therefore essential that treatment tests should progress far enough to indicate satisfactory recovery of both metals before large expenditures on development are undertaken.

"*Treatment and Transportation.*—No treatment tests have been made. The ore is essentially a milling proposition. As the future of the mine depends on treatment, as well as on tonnage, early tests are indicated. By appearance it seems likely that flotation should give reasonably high recoveries, with a relatively high ratio of concentration. If so, your shipping product would be relatively small in bulk and make your transportation problems easy, and cheap per ton of ore, as an easy wagon-road grade to the railway can be obtained with a drop of about 1,500 feet in a distance of less than 7 miles. The present road to Topley is about 8 miles, but can readily be shortened and improved. Easy construction is indicated with no adverse grade.

"*Ore-bodies.*—Certain ore-bodies are partly developed and may be discussed to give some idea of what development has so far disclosed. (*See* attached plan.)

"(1.) 100-foot level, No. 2 W. crosscut: Samples 45 to 50 indicate an ore-body extending to the north-west not yet drifted on, which would probably show up some good ore.

"(2.) 100-foot level, main drift north of No. 2 E. crosscut: Samples 37 to 40 show up ore as follows: Length, 20 feet; average width, 3.2 feet; average value, $20.47. Not fully developed. (Silver at 57 cents per ounce.)

"(3.) 100-foot level, No. 3 crosscut W.: Samples 15 to 24 and 54 to 60. This ore-body is only half developed, good ore continuing to the north-west. Developed length, 60 feet; average width, 2.9 feet; average value, $12.38.

"(4.) 100-foot level, No. 4 crosscut W.: Samples 32 to 36. Partly developed, as crosscut is probably off the main ore inside of sample 32 as exposed by a recent blast. Developed length, 40 feet; average width, 2.3 feet; average value, $10.12.

"(5.) 100-foot level, No. 5 crosscut W.: Samples 7 to 14, while low grade, are from relatively large and strong showings and indicate a possible good ore-body if drifted on to the north-west.

"Combining (2), (3), and (4), we have approximately 30 tons per foot of depth averaging $13.21 per ton. A comparatively small amount of further development on these might easily double this tonnage. The above five showings are included in a length of about 200 feet along the general zone.

"(6.) Taylor crosscut, 50-foot level: Samples 25 and 26 represent the low-grade side of the crosscut. Judging from numerous engineers' samples that I have seen, the values here would probably average much like those on the 100-foot level; that is, from $10 to $15 per ton. Owing to its width of over 15 feet the developed length of 20 feet alone represents nearly 30 tons per foot depth and tends to confirm the vertical continuity of the ore-bodies, especially in conjunction with the good oxidized ore also exposed and represented by sample 27.

"(7.) Surface oxidized ores of the type of sample 27 and of good grade appear to occur in the outcrop. This may possibly prove to be an asset of considerable value.

"*Geology.*—The ore occurs in a formation locally known as topleyite, which is a highly altered rock containing, roughly, 50 per cent. silica and up to 40 per cent. of lime and magnesia carbonates. In this formation are a number of dark irregular bands. The appearance suggests a highly contorted and faulted limestone-slate formation chemically altered, but more likely perhaps in a tuff or much altered variation of the andesite which adjoins it. The andesite is a very dark blocky basis volcanic rock, which looks like a basic dyke, but is reported to form the mass of the mountain which lies to the north-east.

"The fault-contact between the andesite and the topleyite strikes about N. 30° W. and dips 55° westerly, the andesite being on the easterly side. The line of contact is nearly straight as far as exposed. The surface is practically all covered with glacial drift, so that the extent of the occurrence cannot be traced by outcrops. One oxidized outcrop is reported, carrying fair values, some 300 feet north-east from the shaft.

"Ore occurs in the topleyite in a series of irregular bands corresponding chiefly with the darker bands of rock, which appear to angle away from the contact, and plunge downwards, towards the north-west. There is much faulting and folding and the true structure is not yet certain. The contact may be taken provisionally as the foot-wall of a zone of unknown width, in which ore has been found so far for a distance of about 100 feet from the contact. The surface is reported to show ore for a width of 300 feet and for about the same length, any extensions being covered with glacial drift.

"Mineralization consists of pyrite, arsenical iron, and slight galena and zinc-blende, with considerable quartz in places, some of the latter showing banded vein-structure. High-temperature minerals are not noticeable in general. The metallic minerals are small in quantity, say under 5 per cent., and are generally disseminated in moderately fine-sized crystals. The gangue is mostly the darker topleyite sometimes hardened by silicification, but generally fairly soft. In the sump of the shaft mineralization occurs apparently in the andesite just under the contact and looks much like the darker ore-bands in the topleyite. In No. 2 E. crosscut a small vertical well-defined vein, with frozen walls, occurs in the andesite, with good values. It is the best-defined showing in the mine. Evidently the andesite is not necessarily a barren formation.

"The essential values are gold and silver, the best grades being usually associated with perceptible amounts of galena and blende. Their exact mineral association is not yet known.

"*Development.*—There is at present nearly 800 feet of underground development-work, partially developing to a depth of about 100 feet, a length of about 250 feet, and a width of about 100 feet. Further preliminary development is required to define the nature and extent of the ore-bodies. Driving north-westerly from sample 60, with possibly a little raising and sinking here, would help to define the best present exposure and prove whether or not the ore has a north-west-running tendency. General extensions of drifting along or parallel to the contact, northerly and southerly, are also indicated, in the latter case following the ore at the contact shown by sample 53. It is a little early yet to decide on a permanent shaft location, the present shaft not being very well situated or on any particular system. The slope of the ground is too flat for development by tunnel and shaft-sinking will be required.

"*Diamond-drilling.*—The formations being soft could be drilled very rapidly. The chief difficulties would arise from the soft faults, which would cause loss of core and perhaps caving of holes in places. Diamond-drilling would give much valuable information in regard to extent and direction of the ore-zone and occurrence of ore, but core assays would be uncertain in regard to average values as the ore is somewhat spotty. A little more underground drifting would probably enable drilling to be planned more intelligently, and should be done first.

"Surface conditions would be apparently fairly good for electrical prospecting, but the nature of the ore, low in metallic content, suggests that the results might be rather indefinite. It does not appear advisable at present.

"*Plant and Equipment.*—The present equipment, including a 50-horse-power Vickers-Petter oil-engine and a 240-cubic-foot belt-driven compressor, is neatly installed and capable of carrying out the preliminary development required for some time to come without any further major expenditure, though a larger hoist might soon be found advisable. There is no evidence of extravagance at the mine, the whole layout has a businesslike appearance, and the management appears to be efficient and economical.

"*Power.*—A good water-power is reported to exist some 20 miles to the north, which may be useful in the future. For the present oil-fuel appears to be the most convenient and cheapest source of power. There is no water-power in the vicinity.

"*General Conditions.*—These may be considered quite favourable. The ground is easily mined and stands fairly well, not requiring much timber. There is ample fair timber on the ground for mine and firewood, and probably sufficient water for domestic and milling purposes, though the supply is rather limited. Pumping is required, the mine at present making under 10 gallons per minute. The water is hard and should be tested for use in milling when flotation tests are made. It is impossible to predict the best mining method yet until the ore-zones are better defined, but as the ore seems to have a rather flat-lying tendency ease in breaking may be offset by some difficulty in handling, so that in the meantime very cheap mining costs should not be anticipated, though, on the other hand, there are no special difficulties which would give rise to high costs.

"The mine is located about 7 miles north of Topley, B.C., which is 285 miles by rail east of Prince Rupert. Topley is about 2,000 feet above sea-level and the mine about 3,500 feet above sea-level. The deposit is more or less unique, there being no other mines near by to which it can be compared. There is good sleighing for several months in the winter."

**Cup.** This group, owned by Matthew Sam, was operated under option during the year by the Topley Consolidated Mining and Development Company, Limited. Work was suspended in July and the option subsequently relinquished, and the company went into voluntary liquidation to be absorbed by the newer incorporation, the Topley-

Richfield Mining Company, Limited. The work carried out comprised erection of camp buildings and tunnelling, but the latter disclosed no mineral of importance. The property lies about 1½ miles south-east of the *Richfield* mine and is reached by a branch road about 2 miles in length, which leaves the Topley–Babine road about 4 miles from Topley.

The mineral occurrence is that of a flat-dipping vein in the andesite country-rock, which forms the steep left bank of Findlay creek and in which all workings and exposures occur. The latter form almost a horizontal line. The strike is north-westerly. Owing to local folding, direction of dip varies and is very flat. The mineralization consists of galena and zinc-blende with iron pyrites in a quartzose gangue, and is not very pronounced. The width of the vein varies up to 6 feet.

At 3,300 feet elevation a tunnel is run on a bearing S. 55° E. (mag.) a distance of 40 feet, but nothing is disclosed. Apparently the tunnel was started on the vein, which subsequently split in two branches, both of which diverged from the tunnel.

About half a mile lower down the creek than the foregoing tunnel, at an elevation of 3,260 feet, another tunnel is run a distance of 40 feet, following a very flat vein. At this point the strike is S. 25° W. (mag.) and dip very flat to the south-east. The face shows a vein 3½ to 4 feet in width, fairly well mineralized, and is promising.

At 3,245 feet a tunnel is run 80 feet on a bearing S. 60° E. (mag.) and the vein dips slightly north-west. At 65 feet from the portal the vein passes into the back, at which point a seam of galena and zinc-blende shows, 4 inches in width. A sample of this assayed: Gold, trace, silver, 5.2 oz. to the ton; lead, 41 per cent.; zinc, 7 per cent.

Another tunnel farther down the creek than the above workings is said to have been driven a distance of 50 feet, but was not inspected. It is stated that no material amount of mineral shows in this tunnel.

Two camp buildings were erected by the road at the top of the creek-bank at an elevation of 3,365 feet. It is understood that after the option on this property had been relinquished the owner did some work and reports a find of ore in a new place. The galena on this property has apparently so far not shown very good silver values. Further mention of this property is made in the Annual Report for 1924.

**Golden Eagle.** This group, owned by D. Heenan and C. Matheson, is situated about half a mile east of the *Cup* group. A trail leads to the property from the *Cup* wagon-road. At the time of inspection in July there was exposed at an elevation of 3,630 feet in somewhat flat country a quartz vein striking N. 50° W. (mag.) and dipping north-easterly. Exposure was by open-cut. A width of about 1½ feet of slightly mineralized quartz was then evident, with the hanging-wall not exposed. The country-rock is andesite breccia. It is understood that very promising developments have taken place at this property since inspection and that ore carryring high silver values due to grey copper has been struck. The owners are continuing work at the property this winter and expect to make a shipment in the spring of 1928. They report that at the end of December they are meeting with good shipping-ore in a shaft which they are sinking. This property is distant only about 6½ miles from Topley.

**Box.** This group of four claims, owned by F. H. Taylor, adjoins the *Golden Eagle* group on the south-west and is situated at practically the same elevation as the latter. At 3,650 feet elevation a well-mineralized replacement fissure in porphyritic andesite, striking N. 64° W. (mag.), dipping north-easterly, is exposed over a length of 10 feet by open-cut. The width appears to be about 4 feet, although walls are not well exposed. There is exposed a nice strong-looking seam of galena 4 inches in width, a sample of which assayed: Gold, 0.06 oz. to the ton; silver, 82 oz. to the ton; lead, 48 per cent. The mineralization also shows a little zinc-blende and arsenopyrite. This showing well merits further development, especially in view of the developments in the parallel vein system on the *Golden Eagle* group.

At another point some considerable distance south of the above-described exposure, at an elevation of 3,600 feet, another parallel vein is exposed by three open-cuts at intervals over a length of about 300 feet. Of these, one is 10 feet deep and about 25 feet in length along the strike. A seam 10 inches wide shows for a length of 15 feet and is fairly well mineralized with galena and zinc-blende. The strike is N. 60° W. (mag.) and dip northerly. The country-rock is porphyritic andesite, which strikes N. 30° W. (mag.) and dips southerly. It is highly altered

to a material somewhat resembling topleyite in the vicinity of this replacement mineralization. A sample taken across a width of 10 inches in the open-cut assayed: Gold, trace; silver, 3 oz. to the ton; lead, 8 per cent.; zinc, 10 per cent.

*Perow.*

**Lucky Sunday.** This group, owned by P. LeRoss, is situated 500 yards east of Perow Station (flag-station on the Canadian National Railway 6 miles west of Topley). On the south bank of the Bulkley river there are exposed, for a length of about 300 feet, beds of volcanic breccia and agglomerate, striking S. 85° W. (mag.) and dipping southerly at about 35°. These are somewhat pyritized and at one point the breccia blends into a much-altered form somewhat resembling topleyite in appearance. In this a replacement fissure striking N. 25° W. (mag.), with almost vertical dip, shows a sparse mineralization of iron pyrites. A sample taken of this showed only traces of gold and silver.

**Wade.** This property is situated 1 mile east of Perow on Mackaboy creek. A description will be found in the Annual Report for 1926. An inspection was made this year in company with the optionee, R. L. Gale, for the purpose of examining rock-exposures, which in one place somewhat resemble topleyite, at a point about 75 feet above the creek on the left bank. A sample of this upon analysis gave the following results: CaO, 3 per cent.; MgO, 1.1 per cent.; $SiO_2$, 52.2 per cent. This strengthens the opinion formed from apparent visible resemblance, but it is apparently not quite so much altered as topleyite at the *Richfield* mine. It shows a sparse sulphide mineralization, but assay showed no values in gold or silver. Judging from the neighbouring rocks, it appears to be an altered form of andesite.

*Forestdale.*

Forestdale is a flag-station on the Canadian National Railway 8 miles east of Topley.

**Skaret.** This group of seven claims, owned by P. Skaret, A. Gustafson, and P. Olsen, is distant about 4 miles west of Forestdale, within 400 yards of the railway-track. The Bulkley river exposes at this point, on either bank, somewhat thinly bedded andesites striking N. 30° W. (mag.) and dipping southerly. On the south side of the river a bluff of volcanic rocks rises about 300 feet or so above the river. At various points in these rock-exposures, open-cuts show a very sparse mineralization of pyrite, but there is no evidence of a vein or replacement fissure. A sample from one open-cut showed traces of gold and silver.

*Babine Lake.*

The properties described below on Newman peninsula, and McDonald island, Babine lake, are included in the Topley section because they are most conveniently reached from Topley. Between Topley and the mouth of Fulton river, Babine lake, there is a wagon-road about 25 miles in length. McDonald island lies on Hagan arm of the lake, about 10 miles due north of the mouth of the Fulton river. Pack-horses and motor-boat can be hired from B. McCrea, who also owns a hotel at Topley.

**Richmond.** This group, owned by H. J. Macdonald, of Burns Lake, is situated on McDonald island. This island is situated at the mouth of Hagan arm and is roughly of the shape of an equilateral triangle, each side of which is about 1½ miles in length. Like other islands in this lake, it is heavily timbered down to the shore. The elevation of the lake is 2,222 feet above sea-level. On the south side of the island the ground rises gradually from the lake to a point about 100 feet vertically above the latter, where a large exposure of batholithic rock, mainly granite, rises somewhat abruptly to a height of about 250 feet above the lake-level. Volcanic rocks outcrop at the west end of the island.

There is therefore exemplified another of the many instances of intrusions of granitic rock in the volcanics of the Nechako plateau. In the case of this group the entire mass of granitic rock appears to be mineralized with essentially copper pyrites and its oxidation product malachite. In the intruded volcanics adjoining on the west the mineralization is galena and zinc-blende (that of the *Robin Hood* group described below).

One tunnel 75 feet in length, another 30 feet in length, an open-cut 100 feet in length, and a shaft about 25 feet in depth, all within an area of about 600 feet square, demonstrate that the granitic rock is mineralized extensively and some portions seem to contain a higher per-

centage of copper than others. A grab sample taken from one of the tunnels assayed: Gold, trace; silver, 0.4 oz. to the ton; copper, 1 per cent. This represents the better portion of batholithic rock and the superficial average would probably be under 1 per cent. copper. One interesting feature of this property is that there is presented in the form of talus a very considerable tonnage of broken "ore." Leaching possibilities are indicated. Careful superficial sampling of the batholith, and as far inward as workings permit, is warranted to determine the advisability of diamond-drilling. If this property does not constitute a low-grade copper property of magnitude, it is, at any rate, rather a challenge to the miner and metallurgist.

Time did not permit of an examination of any other part of the island, except the extreme west end, where the *Robin Hood* group is situated, but the surface is clearly worth close prospecting, if this has not already been done, because galena-zinc blende mineralization in the volcanics is clearly to be expected as well as that in the granitic rock.

This property is commended to the attention of examining engineers as meriting investigation.

**Robin Hood.** This claim is owned by Chas. Newman and is situated on the west end of McDonald island. Andesites outcrop at this point, striking north and south (mag.). A tunnel, now caved and inaccessible, was run at the lake-level some considerable time ago, following a vein striking N. 32° E. (mag.) and dipping at about 60° south-easterly. The face of the tunnel is said to show a width of 1½ feet of mixed galena and zinc-blende. Evidently a considerable amount of mineral was struck, because there is a pile of ore at the portal of the tunnel. A grab sample of this assayed: Gold, 0.10 oz. to the ton; silver, 12 oz. to the ton; lead, 13 per cent.; zinc, 19 per cent.

At the time of inspection the owner was engaged in clearing the cave. This showing is well worth following up, and an examination of rock-exposures on the lake-shore at this end of the island can readily be made and might prove helpful. Indeed, the whole of this island should be closely prospected, if this has not already been done.

**Babine.** This claim, owned by Chas. Newman, is situated on Newman peninsula, by the lake-shore, at or close to the 55th parallel or north latitude. In the immediate vicinity of a granitic intrusion into beds of andesite and rhyolite two tunnels are run at lake-level, at points about 600 feet apart, one in each limb of a synclinal fold. Of these, the more southerly follows for 66 feet a mineralized bed of andesite within a few feet of the granitic intrusion. Mineralization consists of chalcopyrite, pyrite, pyrrhotite, zinc-blende, and a little arsenopyrite. A sample taken across a width of 4 feet at the face of this tunnel assayed: Gold, trace; silver, 0.4 oz. to the ton; copper, 0.5 per cent.; zinc, 4 per cent.

Just north of this tunnel a cliff-like exposure of the volcanics shows a dissemination of the above-described minerals following the numerous small fractures in the rock. One small seam of chalcopyrite 2 inches in width assayed: Gold, 0.12 oz. to the ton; silver, 13.6 oz. to the ton; copper, 18.7 per cent.; zinc, 6 per cent. Geological conditions are favourable at this point and would seem to warrant further prospecting on the part of the owner.

The more northerly tunnel has been advanced a distance of 42 feet, following a similar mode of occurrence to that just described, but in this case mineralization is very sparse and an assay of a sample showed no values. A winze about 10 feet deep is also sunk in the floor of this tunnel. Just north of this tunnel rhyolite outcrops on the lake-shore and is somewhat mineralized with iron pyrites.

## Burns Lake Section.

**Taltapin Mining Co., Ltd.** A description of the property of this company will be found in the Annual Reports for the years 1920, 1925, and 1926. Matter therein contained will not be repeated in this report. The property was inspected at the end of July, at which time operations had, by chance, been temporarily suspended owing to trouble experienced with a 60-horse-power semi-Diesel engine, which together with a Holman air-compressor had been installed in the spring of 1927. The shaft (*see* 1926 Annual Report) was under water in consequence, and therefore it was not possible to inspect it. All surface showings deemed by the company to be of importance were shown to the Resident Engineer by an employee of the company delegated for the purpose by the manager. Tunnels on the *Macdonald* and *Silver Fox* claims were also inspected. With the exception of the shaft, therefore, this and previous reports cover progress up to date of this inspection.

Surface showings were inspected within a region extending about 4 miles north-east of the *Silver Fox* claim and 2 miles south-east of the latter. Inspection renders evident that a very

large stock of batholithic rock (many phases of which are represented by the outcrops) occurs on the east side of Anderson creek, which extends in a northerly distance for some miles. Anderson creek appears to mark the southern edge of the batholithic rock and the main contact with the volcanics. Numerous injection tongues run out from the batholith into the volcanics. Generally speaking, therefore, conditions are favourable for ore-deposition in such a region. Unfortunately, however, so far, no well-mineralized surface showings have yet been discovered, with the possible exception of the vein named by the company the "High Grade vein."

To more particularly describe the surface showings inspected this year: The *Le Croix*, *Grey Copper No. 1*, and *Sunrise D.* claims lie in a south-east line from the *Silver Fox* claim, the *Sunrise D.* being the most southerly and distant about 2 miles from the latter. It is particularly pointed out that whenever it was possible to do so *selected* pieces of the best mineral-showing were taken for assay.

*Le Croix.*—Surface exposures consist of small quartz-seams mineralized with copper-stains and sparse sulphides in andesite country-rock. A sample of selected pieces assayed: Gold, trace; silver, trace; copper, 0.5 per cent.

*Grey Copper No. 1.*—In the near vicinity of a granitic intrusion an open-cut exposes andesite country-rock, but no appreciable quantity of mineral was visible.

*Sunrise D.*—On this claim, in the immediate vicinity of a batholithic intrusion, a quartzose vein several feet in width shows a sparse mineralization of galena, zinc-blende, chalcopyrite, and copper-stain. The vein strikes N. 55° W. (mag.) and dips south-westerly at a flat angle. A shaft sunk 15 feet follows the mineralization downwards and exposes a width of 3½ feet. A sample across this width assayed: Gold, trace; silver, trace; copper, *nil;* lead, 0.6 per cent. A sample of selected pieces assayed: Gold, trace; silver, 0.9 oz. to the ton; copper, 2 per cent.; lead, 1.2 per cent. Distant about 100 yards from the foregoing is another exposure of a quartzose band about 15 feet in width, somewhat oxidized, in sheared batholithic rock. A very sparse mineralization of galena and copper-stain shows. This is possibly a continuation of the foregoing vein. A sample of selected pieces assayed: Gold, trace; silver, trace; lead, 1.2 per cent.

The *Sunrise T.* and *Sunrise No. 1* claims lie in the extreme north-east corner of the company's property and are distant about 4 miles by trail from the *Silver Fox* claim. In this region the country-rock is largely batholithic rock, many phases of which are represented.

*Sunrise T.*—On this claim there is exposed a quartz vein between 8 and 9 feet in width showing pyrite and a very little galena, striking N. 40° E. (mag.) and dipping south-easterly, on which a shaft is sunk to a depth of 12 feet. A sample of selected pieces of the most heavily mineralized quartz showed on assay no gold or silver values.

*Sunrise No. 1.*—About a quarter of a mile distant north-east of the *Sunrise T.* showing is a very large exposure of quartz upwards of 30 feet in width, striking N. 50° E. (mag.) and dipping south-easterly. No material amount of mineral is visible in the quartz. About half a mile distant in a north-westerly direction from this vein is another large quartz vein with similar strike and dip, also very faintly mineralized.

*High Grade Vein.*—This vein is exposed in the bed of Anderson creek just below the main shaft, in which region the creek has cut down to a depth of 75 feet or so in the volcanics, forming a canyon. At the time of inspection several inches of water were flowing over the exposure and conditions did not lend themselves to sampling. The exact width could not be determined, but the vein is stated to be 2½ feet wide at this point. A sample of selected pieces of the most heavily mineralized portions assayed: Gold, trace; silver, 10 oz. to the ton; copper, 3 per cent.; lead, 6 per cent.; zinc, 4 per cent.

*Macdonald.*—On this claim a tunnel has been run a distance of about 55 feet, following a very slightly mineralized shear-zone in andesite. The face showed a little pyrite. A sample at the face showed traces only of gold and silver.

*Silver Fox.*—On the east side of Anderson creek a tunnel has been run 10 feet above creek-level on a bearing N. 40° E. (mag.) to intercept the downward continuation of a vein exposed on the surface, about 75 feet above, and which strikes N. 78° W. (mag.). At the time of inspection the length of the tunnel was 68 feet, not far enough to reach the objective. The tunnel encounters andesite for the first few feet and then continues in batholithic rock to the face.

It is understood that additional machinery is to be installed at this property during the winter.

**Golden Glory.** This property, owned by R. H. and D. M. Gerow and associates, is situated on Reed creek, which flows into Decker lake on the south side, opposite the settlement of Decker Lake, a station on the Canadian National Railway 5 miles west of Burns Lake. The property is distant about a mile from the lake.

Reed creek has cut down to a depth of upwards of 200 feet in the prevailing volcanic rocks, where the mineral-showings occur. For a distance of several hundred feet the creek appears to follow the strike of a vein trending about N. 55° E. (mag.) and dipping north-westerly—that is, under the creek. Surface exposures being very nearly at creek-level, it is a matter of some difficulty to follow mineral-exposures. The vein at one point seems to be fairly well mineralized with galena and zinc-blende of low silver content. At this point a short crosscut a few feet in length was run into the right bank of the creek, and a drift run 50 feet parallel with the creek, following the vein on a bearing N. 55° E. A few sacks of fairly solid sulphide mineral were obtained in this drift, a grab sample of which assayed: Gold, trace; silver, 1.2 oz. to the ton; lead, 14 per cent.; zinc, 38 per cent. It is stated, however, that the mineral pinched out within a few feet and the drift was discontinued, and the crosscut continued on a bearing S. 60° E. (mag.) for a distance of 75 feet, following a diverging stringer dipping north-easterly. It also was discontinued owing to the mineral pinching. It was noted that at about 20 feet from the portal a little mineral showing in the back appeared to run off into the foot-wall, which might merit a little investigation. Some 200 yards lower down the creek there is evidence of what is possibly the continuation of the same vein prospected by the upper workings, and a little investigation at this point also would appear to be worth while.

*Endako.*

Endako is a divisional point on the Canadian National Railway 115 miles west of Prince George. South-west of this point a discovery of molybdenite was made in 1927. It was also noted that outcrops of granitic rock are of somewhat frequent occurrence in the vicinity and the advisability of prospecting the region both north and south of Endako, not necessarily for molybdenite only but for other minerals, is indicated. At Endako there is a hotel and store, where all necessary supplies can be obtained. At the south end of Babine lake there is known to be an extensive stock of batholithic rock and there appears to be no reason why the region southward to Endako should not be promising for mineral occurrence.

**Stella.** This group consists of four claims, owned by A. Langley, C. H. Foote, J. Braithwaite, and W. Foote, and is situated about 5 miles in a direct south-west line from Endako. Access to the property is, however, at present gained by a trail from the Endako–Francois Lake wagon-road, a total distance of upwards of 12 miles from Endako.

The property, which is a molybdenite prospect, lies at an elevation of 3,450 feet in comparatively flat, rolling country well covered with spruce, jack-pine, and poplar timber and a heavy growth of peavine. Its discovery indicates close and patient prospecting. The area is evidently extensively underlain by batholithic rocks, and granite outcrops in several places. Quartz float varying in size from pieces the size of a man's fist to 100 lb. or more in weight, and showing fine scales of molybdenite, is to be found scattered over a comparatively large area. At two or three points molybdenite has been found in place. At one such a quartz-seam 2 feet wide in granite, striking N. 50° E. (mag.) and dipping at about 55° south-east, is exposed by open-cut. A sample taken across this seam assayed 2.43 per cent. molybdenite ($MoS_2$). A similar strike was also observed in the case of other narrower seams in place. About 750 feet west of the above exposure a pit sunk 5 feet to bed-rock showed promising float and there seems every prospect of finding a vein in place in the immediate vicinity.

While, as might be expected, the fringes of batholithic rock are mineralized in places with molybdenite, the prevailing mode of occurrence seems to be in quartz veins. Such scanty evidence as is available points to the likelihood of the existence of a number of more or less parallel quartz veins, striking about N. 45° E. (mag.). These seem likely to contain a good percentage of molybdenite and a noteworthy feature is the apparent entire absence of sulphides other than molybdenite.

This property shows promise and merits further investigation. The mantle of glacial drift appears to be thin, which greatly facilitates surface prospecting. Necessity for the latter is

clearly indicated. The owners purpose constructing a direct trail to the property from Endako during the coming season.

### Sibola Section.

An option on the *Emerald* and neighbouring groups was acquired by the Consolidated Mining and Smelting Company of Canada, Limited, towards the close of 1927, which augurs well for activity in 1928.

A detailed account of the topographic and geologic features of this section, with map and photographs, will be found in the Annual Report for 1916. Refer also to the Geological Survey Summary Reports, Part A, for the years 1920 and 1924.

#### *Sibola Mountain.*

**Oriental.** This group of six claims, owned by Chung King Ho (whose agent is J. W. Ray), is situated on Sibola mountain, between Sibola and Comb creeks, and is distant about 12 miles by trail from the Tahtsa river. It lies at an elevation of between 4,500 and 4,700 feet above sea-level, on the southern mountain-slopes facing the Tahtsa River valley.

The showings consist of a number of narrow quartz veins varying in width from mere stringers up to 1½ feet. In some cases the occurrence is in zones several feet in width, with definite trend, in which the quartz-seams are separated by wide bands of quite unaltered country-rock. In some cases the quartz-seams are quite well mineralized with iron pyrites and very small amounts of galena, but samples taken of the most heavily mineralized portions of the seams failed to show in any single instance more than a trace of gold and 0.4 oz. of silver to the ton. No commercial possibilities are indicated.

To describe the showings in detail: On the *Oriental* claim, at 4,730 feet elevation, a small open-cut shows two small quartz stringers, an assay of which showed only traces of gold and silver. On the *Oriental No. 1*, at 4,615 feet elevation, a large open-cut exposes three quartz-seams, one 8 inches in width on the foot-wall of a zone upwards of 9 feet in width, striking N. 50° W. (mag.), dipping south-west. On the hanging-wall side are two quartz veinlets from 2 to 3 inches in width. Intervening filling in the zone is unaltered country-rock. The 8-inch seam is well mineralized with iron pyrites and shows a little galena. A sample of it assayed: Gold, trace; silver, 0.4 oz. to the ton.

Some 300 yards east of the above exposure, on *Oriental No. 4*, a well-defined zone about 6 feet in width, striking N. 25° W. (mag.), dipping south-west, occurs at an elevation of 4,530 feet. Some years ago, evidently, a material amount of work was done at this place, the zone being exposed for a length of upwards of 300 feet by an open-cut, 10 feet deep in places, along the strike. On the foot-wall of this zone there is a quartz-seam from 10 to 18 inches in width, somewhat oxidized, showing much iron pyrites. The zone shows on the hanging-wall side two quartz-seams 2 or 3 inches in width. The ground between the quartz-seams is unaltered country-rock. An assay of hanging-wall stringers showed traces only of gold and silver. An assay of the foot-wall seam showed: Gold, trace; silver, 0.4 oz. to the ton.

At 4,450 feet elevation another open-cut discloses the same zone at a lower point or another parallel zone. The enclosing country-rock is andesite and interbedded sediments.

**New Westminster Partnership, Ltd.** This is a private limited liability company formed for the purpose of testing the placer-gold possibilities of Sibola creek. Under the management of J. W. Ray, four men were engaged in this investigation during the year. Operations were concentrated on a small portion of Sibola creek at an elevation of about 3,430 feet, at which point appearances suggested that the creek might formerly have occupied a channel somewhat east of its present position. A considerable amount of work was done at this point and a length of 40 feet of bed-rock was cleaned, but it is stated the results were disappointing. On the left bank of the creek in this region is quite an extensive flat area and it is stated placer gold was found in the gravels in former times. Pits have been sunk at various points, testifying that investigation has been made in the past, and it is quite possible that such deposits may contain superficial low placer values. The origin of the gold in this case is doubtless the quartz veins of the *Oriental* group and any neighbouring quartz veins. But deposits of this kind merely represent the resorting action of glacial and post-glacial streams of a large tonnage of low-grade material and superficial values are not indicative of bed-rock concentration.

*Sweeney Mountain.*

**Emerald.** A complete description of the surface features of this property will be found in the Annual Report for 1916, and mention of it is made in the Annual Reports for the years 1917, 1919, 1924, 1925, and 1926. Refer also to the Summary Report, Part A, for 1924, G.S.C., page 56.

The adit-tunnel, which is 120 feet long, is at an elevation of 5,865 feet above sea-level or 3,085 feet above Sweeney Landing on the Tahtsa river, as determined by aneroid. The tunnel is run on a bearing N. 42° W. (mag.), following the mineralization, the dip of which is north-easterly and which varies from about 70° at the portal of the tunnel to about 55° at the face. It is noted that the tunnel cuts across the bedding-planes of the enclosing tuffs at a small angle, but at the face there appears to be a tendency of the mineralization to follow the bedding-planes, which is apparently also exemplified on the surface north of the tunnel in the branch mineralization there evident. The tunnel does not show much ore, but at the face there is a small compact seam of galena and zinc-blende on both sides. A sample of this assayed: Gold, 0.04 oz. to the ton; silver, 12.5 oz. to the ton; lead, 28 per cent.; zinc, 12.2 per cent.

The surface showing is certainly impressive. It seems to be worth bearing in mind the possible intersection on this property of the *Glacier* shear-zone striking N. 35° E. (mag.) with the *Emerald* shear-zone striking N. 42° W. (mag.).

**Glacier.** This group, owned by W. J. Sweeney and associates, is situated at the upper end of the glacier at the head of White river. The showings are distant about 2,000 feet from the *Emerald* tunnel and are situated at an elevation of 5,980 feet, just below the top edge of the glacier. The occurrence is apparently that of a shear-zone from 6 to 8 feet in width, showing seams of galena and zinc-blende and striking N. 35° E. (mag.) and dipping north-west. A sample of picked portions of the mineral assayed: Gold, trace; silver, 12.6 oz. to the ton; lead, 42 per cent.; zinc, 15 per cent. Some 250 feet distant to the south-east is another parallel vein and in immediate proximity a small vein striking N. 80° E. (mag.).

**Stanley.** This group, owned by J. Goold, is situated at an elevation of 5,100 feet, about half a mile east of the *Emerald* group. Open-cuts show two parallel shear-zones apparently in porphyritic andesite, each about 1½ feet in width and showing some nice-looking galena and zinc-blende. The strike of the zones is N. 65° E. (mag.) and dip north-westerly. A sample of picked mineral assayed: Gold, 0.22 oz. to the ton; silver, 66.5 oz. to the ton; lead, 22.8 per cent.; zinc, 14.6 per cent.

Attention is drawn to the grade of the mineral in precious metals, which is markedly higher than that of surrounding groups; more work is justified on this property.

*Swing Peak Mountain.*

**Swannell.** This group of three claims, owned by George Seel, of Wistaria, is situated on the northern slopes of Swing Peak mountain on the south side of the Tahtsa river. It is readily reached by motor-boat from Ootsa Lake Post-office, which is distant 40 miles by motor-road from Burns Lake, the nearest railway-station on the Canadian National Railway. Seel Landing on the Tahtsa river at the foot of Swing Peak mountain (about a mile below Sweeney Landing) is distant about 63 miles from Ootsa Lake Post-office. A trail some 3½ miles in length leads from Seel Landing to the property.

At an elevation of 4,930 feet there is exposed by open-cuts and natural agencies a shear-zone replacement fissure in the enclosing porphyritic volcanic rocks on the steeply sloping mountain-side. Where fully exposed by open-cut the width of the fissure is 9 feet 6 inches. Mineralization is mainly confined to a width of 10 inches on the foot-wall and consists essentially of galena and zinc-blende, together with small amounts of chalcopyrite and grey copper. The fissure strikes S. 30° E. (mag.), with steep, almost vertical, dip to the south-west. The fissure does not entirely coincide with the bedding-planes of the enclosing country-rock, which strike S. 40° E. (mag.) and dip north-east. The mineral has a tendency in places to follow along the bedding-planes, apparently forming small branch veins. It might be noted that this feature is exhibited by other shear-zones in the Sibola section. This shear-zone is exposed for a length of about 300 feet along its strike. Some very beautiful specimens of blood-red zinc-blende were observed. A sample of picked ore from the open-cut assayed: Gold, trace; silver, 70 oz. to the ton; lead, 58 per cent.; zinc, 5 per cent.

About 200 feet east of the above-described fissure, at a lower elevation, is exposed by natural agencies another shear-zone showing some nice clean galena and a little zinc-blende. This strikes S. 15° E. (mag.) and dips north-east. These two fissures are likely to intersect higher up the mountain and quite possibly on the property other shear-zones exist which should be looked for. A sample of the last-mentioned shear-zone, of selected ore, assayed: Gold, trace; silver, 162 oz. to the ton; lead, 40 per cent.; zinc, 8 per cent.

While very little development has been done on this property, appearances promise well. The surrounding geology is favourable and good silver values are a gratifying feature. The topography lends itself to economic exploration by drifts on the vein from the surface and the property clearly merits further development. It seems a reasonable expectation that such development will disclose bodies of ore which can be hand-sorted to good shipping grade. Before any underground work is started it is, however, recommended, as being a sound maxim applying to prospects generally, that the surface be thoroughly prospected first and that open-cuts be made at intervals in the fissures already discovered.

Noteworthy is the fact that the owner last year with commendable energy packed on his back several hundred pounds of ore from his property down to the Tahtsa river, conveyed it in his motor-boat to Ootsa Lake Post-office, and shipped it to the smelter at Trail.

The property suffers from a certain geographic disability, in common with others in this section, but if developments warranted it navigation on the Tahtsa river could be greatly improved by clearing out obstructions and log-jams in the river-channel and so facilitating shipments via Burns Lake. This property is commended to the attention of examining engineers.

*Whitesail Lake.*

**Sunset.**

This group is owned by C. V., W. H., and J. E. Harrison. A description of it will be found in the 1926 Annual Report, and also in the Summary Report, Part A, 1924, G.S.C., page 52 (under "*Cariboo* Mineral Claims"). A new discovery was made by the owners this year at a point about 300 yards west of the tunnel previously run at the lake-level following zinc-showings. About 40 feet above the lake-level a shear-zone fissure, striking N. 57° W. (mag.) and almost vertical, 6 feet in width, is followed by a tunnel for a distance of 15 feet.

Mineralization consists essentially of zinc-blende and galena, with a preponderance of the former. There is also much iron pyrites. A sample across a width of 6 feet at the face assayed: Gold, trace; silver, 2 oz. to the ton; lead, *nil;* zinc, 17.2 per cent. A sample of selected pieces of mineral assayed: Gold, trace; silver, 9 oz. to the ton; lead, 24 per cent.; zinc, 18.8 per cent.

Inspection of the dump shows that some massive zinc-blende and galena were encountered by the tunnel. This is a strong showing and very close to the available water transportation of this section. The enclosing country-rock is water-lain tuffs close to the contact with rhyolite.

MANSON SECTION.

A full account of the topographic and geologic features of this section will be found in the Annual Report for 1924, which also contains references to pertinent reports issued by the Geological Survey.

There are four available routes into the Manson section from railway points, as follows:—

(1.) From Hazelton by pack-trail to Fort Babine (50 miles); thence to Takla lake (35 miles); thence to Manson Creek (72 miles).

(2.) From Vanderhoof by motor to Fort St. James (40 miles); thence by pack-trail to Manson Creek (131 miles).

(3.) From Vanderhoof by motor to Fort St. James (40 miles); thence by motor-boat via Stuart, Trembleur, and Takla lakes to Takla Landing (110 miles); thence onward as in (1).

(4.) As an alternative to the latter portions of routes (1) and (3), from Takla Landing onward by pack-trail to Old Hogem on the Omineca river (35 miles); thence by motor-boat (none are available at present at Old Hogem) down 40 miles of quiet water to Germansen Landing at the mouth of Germansen river; thence by trail to any desired part of the Manson section. The Manson Creek Post-office is distant 17 miles by trail from Germansen Landing.

If Hazelton is the starting-point, pack-horses can be secured by giving advance notice to G. M. Beirnes, Hazelton. If Vanderhoof is the starting-point, the same facilities can be obtained by communicating with the Takla Lake Trading Company, Vanderhoof. To travel by route (4) special arrangements must be made in advance.

For the information of prospectors and others the following rates, quoted by the Takla Lake Trading Company, give the cost of delivering supplies from the railway to various points in the north:—

| | Per Lb. Cents. |
|---|---|
| Vanderhoof to Fort St. James | 1 |
| Fort St. James to Takla Landing | 2 |
| Takla Landing to Manson Creek | 8 |
| Fort St. James to Manson Creek (all-land route) | 10 |
| Takla Landing to McConnell creek (Ingenika river) | 15 |
| Takla Landing to Thutade lake (head of Finlay river) | 20 |

This year new stores have been opened in the north: At North Fork Lake, Ingenika river, by the Takla Lake Trading Company; on Finlay river, between Fox and Kwadacha (White) rivers, by the Hudson's Bay Company; at Germansen Landing, Omineca river, by Messrs. Crites. It should be understood that the pack-horse is the means of transport (except on water sections, of course) at present over all the routes mentioned.

A trip was made during 1927 into the Manson section by the Resident Engineer by pack-train from Fort St. James to Manson Creek, returning to Hazelton by route (1). The latter route is fully described in the Annual Report for 1924. A brief description follows of the route from Fort St. James to Manson Creek by pack-trail:—

The town of Manson Creek is situated almost due north of Fort St. James, and the pack-trail, although keeping to the high places to avoid swampy ground, maintains a remarkably straight course. The topography is characteristic of the Nechako plateau, rounded hills and wide valleys. A heavy mantle of glacial drift obscures rock-outcrops and adds to the subdued relief. The highest point reached by the trail is that of the rolling summit of Bald mountain, a few miles south of Manson Creek, the elevation of which is 4,800 feet above sea-level. A feature of the region traversed are the very large tracts of meadow land which fringe the various creeks and form ideal camping-places en route. Of these may be mentioned in particular "Grand Prairie," some thousand acres in extent just east of Pinchi lake, now constituting Cassiar Ranch, owned by A. McCorkell, and Moos-moos meadows, 14 miles north of the Nation river.

At low stages of the water the Nation river is crossed by ford at the foot of Chuchi lake. At other times horses must be swum across the lake, which is about half a mile wide at this point, and supplies conveyed across on raft. It is well to mention that the current in this lake is stronger than is apparent from the shore, and crossing by raft should not be attempted within half a mile of the ford, below which there are rapids. In the case of this particular trip, one and a half days were lost at this point owing to high water preventing fording and compelling adoption of the mode of crossing described. With a pack-train a daily average of 15 miles is good, considering the various contingencies incidental to this mode of travel. Ordinarily the time occupied by pack-train from Fort St. James to Manson Creek is ten days. In this case the time taken was eleven days. The following itinerary will give an idea of the various camping-places en route, the distance between them, and their elevations as determined by aneroid:—

June 15th. Fort St. James (2,200 feet), over Murray mountain to Cassiar Ranch (2,530 feet), 17 miles.
June 16th. Cassiar Ranch to Tezzeron (known as Poison locally) creek (2,725 feet), over Lookout mountain (3,220 feet), 10 miles.
June 17th. Tezzeron creek to Butchers flat (2,845 feet), 14 miles.
June 18th. Butchers flat to Kalder (Horseshoe) lake (3,020 feet), 15 miles.
June 19th. Horseshoe lake to Shoemakers flat (2,940 feet), 18 miles.
June 20th. Shoemakers flat to Nation river (2,730 feet), 8 miles.
June 21st. Crossing Nation river.
June 22nd. Nation river to Moos-moos meadows (3,300 feet), 14 miles.
June 23rd. Moos-moos meadows to Conrad camp (3,750 feet), 14 miles.
June 24th. Conrad camp to foot of Bald mountain (4,130 feet), 9 miles.
June 25th. Foot of Bald mountain to Slate Creek camp (3,100 feet), 12 miles. Highest point on trail, 4,800 feet. The elevation of Manson Creek Post-office is 3,130 feet and it is about 1½ miles south of the Slate Creek camp above mentioned.

The timber-growth in the region traversed is that almost invariably characteristic of deposits of morainal gravel—namely, jack-pine, spruce, and poplar. A stand of timber on a ridge between Butchers flat and Kleedlee crossing is remarkable for the great height (150 feet or more), straightness, and uniform girth of the individual trees. The growth is mainly jack-pine and spruce.

The geology of the region is thus described by Charles Camsell in the Geological Survey, Summary Report for 1915:—

"On Stuart lake the rocks consist of massive blue limestone underlaid by cherty quartzites, argillites, and green schists, the latter probably altered volcanic rocks. . . . Fresh-looking and unaltered rocks of presumably Tertiary age occupy the country bordering the trail between Pinchi lake and the Nation river. On account of thick covering of drift, however, few outcrops were observed. These are andesites, diabases, porphyries, or breccias, which form as a rule low hills with irregular and broken outline, trending in a north-west direction. Lookout mountain at the east end of Tezzeron lake is a flat-topped isolated hill with steep cliff-faces and composed of a fine-grained black diabase. . . . Bodies of granite are exposed in the country between the Nation and Manson rivers."

*Expeditions of G. W. Otterson and W. M. Ogilvie.*—It seems desirable to make brief mention of attempts by G. W. Otterson and W. M. Ogilvie to get machinery into the Manson section from Fort St. James by the all-land route much as above described. These attempts were commenced in February, 1926, and repeated at intervals up to the present time. In June last the equipment of G .W. Otterson was 36 miles and that of W. M. Ogilvie 15 miles from Manson Creek, with Bald mountain still to be negotiated or got around in both cases.

G. W. Otterson, with some 30 tons of machinery, starting in February, 1926, made the attempt with Fordson caterpillar tractor and sleighs in winters only. W. M. Ogilvie, with, it is understood, upwards of 4 tons of material, tried with wagon in summer of 1926, continuing with sleighs in winter of 1926 to 1927.

The route followed to the Nation river by these expeditions is that shown by the V. H. Williams 1920 Railway Reconnaissance Survey and lies somewhat east of the pack-trail, crossing the Nation river at Suschona creek. This route from Fort St. James is, presumably, that which a main trunk road northward will one day follow. Assistance in slashing out this road was given by the Departments of Mines and Public Works jointly, and a road has been slashed out round Bald mountain to an old road at the head of Manson river, which extends from that place to Germansen river. These attempts demonstrate their impracticability. To attempt to haul in wagons over a surface which does not approximate a *road*, for long distances, is to incur a cost greatly exceeding that of pack-horse transportation. If the attempt is made with sleighs in winter, adverse climatic conditions, difficulty of keeping the road open, and distance from base of supplies combine to make the result much the same. The moral is, therefore, that the cheapest expedient for transporting machinery such a distance as this, when the cost of a road would be quite prohibitive, is the pack-horse, even if this means the extra cost of having the machinery made sectionalized for the purpose.

There is, however, another way of getting heavy machinery into the Manson section, which would seem to have many advantages over that discussed. This is route (4) previously mentioned. This would involve only some 43 miles of road-construction as against about 130 miles by the route selected. This is a summer route only, but the same applies to any long stretch of road in these northern latitudes.

*Manson Creek Town.*—The town of Manson Creek now consists of two houses only, the post-office and one other cabin. The Postmaster and Deputy Mining Recorder, W. B. Steele, an old-timer, with an intimate knowledge of the section, voluntarily rendered the Resident Engineer every assistance within his power and special thanks are tendered to him.

*General Impressions.*—Generally speaking, the impression derived from a brief inspection of the Manson section is that of glacial and post-glacial stream concentration, with little or no evidence of pre-glacial concentration. Large bars and benches are of wide distribution throughout the area, and to ascertain large-scale possibilities, dredging and otherwise, systematic drilling is required. This should obviously be the first step after preliminary testing with rocker. On Germansen river hydraulic possibilities are indicated. One small hydraulic is in operation and the plant for another is being assembled.

The frequent occurrence of quartz veins, both wide and small, and their mineralization, is strongly reminiscent of other placer sections of this Mineral Survey District and appears to indicate the original source of the placer gold. The prevalence of the green mineral mariposite (frequently mistaken for malachite) in the rocks enclosing the quartz veins was also noticeable, so much so as to incline the belief that this mineral might be used as a useful indicator of the presence of placer gold as described under "Prospecting" in the "General Summary" section of this report. For example, it was noted that at the east end of 12-Mile meadows the trail crosses a large creek, unnamed apparently, but seeming to drain the western slopes of Tom mountain; mariposite is visible in the rocks a few feet from the trail and this creek would appear worth prospecting for placer.

While many of the quartz veins show small amounts of galena, there appears to be no reason for anticipating that in such veins, under any condition of transportation, the lead content can be any more than a by-product in an operation justified by some other metallic constituent.

*Lost Creek.*—Some unstaked quartz veins showing some galena were examined on this creek. At a point on the creek's left bank, about 1½ miles above the mouth, just above W. B. Steele's cabin, a quartz vein 6 feet in width, showing a little galena, striking north-easterly, dipping north-westerly, cuts across the enclosing schists.

About half a mile lower down the creek quartz veins are exposed on both sides of the creek, and the country-rock, a silicified quartzose schist, shows much mariposite. These veins appear to be interbedded, striking north-east and dipping north-west. On the right bank several veins, varying in width from 2 to 4 feet, occur within a width of 20 feet. One shows a seam of galena 6 inches in width, a sample of which assayed: Gold, trace; silver, 11 oz. to the ton; lead, 26 per cent.; zinc, *nil.* Such does not appear to indicate any hopeful commercial possibilities.

*Lead Showings on Boulder Creek.*—A showing of lead ore having been reported on Boulder creek, unstaked at present, a determined but unsuccessful attempt was made to locate it. Unfortunately the time occupied in making the trip from the base camp on Slate creek was somewhat underestimated, involving an interval between meals of a day and a half and compelling return to camp. Lack of time precluded the possibility of renewing the attempt. W. B. Steele, who saw these showings some years ago, describes the occurrence as that of a quartz vein about 60 feet in width mineralized with galena. Quartz veins of such width are not uncommon in placer-gold sections.

*Slate Creek.*—Some drilling was done on this creek last year in the narrower portion of the creek, about 3 miles from its mouth. Exact results are unknown. The upper portion of the creek, which opens out into a wide valley, would appear worth testing, at any rate, to determine the advisability of drilling. It is understood that the whole of Slate creek is held by W. M. Ogilvie's principals.

On the left bank of Slate creek, about a quarter of a mile above the Kildare Camp buildings, an open-cut exposes a quartz vein 10 inches in width, a sample of which assayed: Gold, 0.06 oz. to the ton; silver, 1.4 oz. to the ton; lead, trace. This offers, needless to say, no commercial possibilities.

*Germansen River.*—(More generally termed Germansen creek.) Features of this river are the occurrence of low-lying benches and bars, such as "Holloway's bar," with no overlying boulder-clay; in other places bed-rock benches are overlain with upwards of 10 feet of auriferous glacial gravels, which again is overlain with upwards of 75 feet of boulder-clay, such constituting hydraulics, of which that of Ah Lock is an example. Extensive post-glacial runs of gravel over boulder-clay occur at the upper end of the river. Below the old town of Germansen, 2½ miles from the mouth, by Plug Hat mountain, the river swings sharply to the east, having been deviated apparently from its one-time channel by glacial debris which is apparent. This gives rise to the question of hydraulic possibilities on the lower side of the obstruction.

Rock-outcrops noted on the river were green schist, silicified sericite-schist, thinly bedded argillites, and serpentine. The latter was sampled and assay made for platinum, but none was found. It is interesting to note that the occurrence of small quantities of platinum in the gravels of this river is reported.

The following elevations determined by aneroid (assumed correct) are given for reference:—

| | Feet. |
|---|---|
| Germansen Landing (mouth of river) | 2,260 |
| Plug Hat mountain | 2,610 |
| Germansen (old town) | 2,360 |
| Upper end of canyon | 2,445 |
| Holloway's bar | 2,610 |
| Slate creek (Kildare camp) | 3,100 |
| Manson Creek Post-office | 3,130 |
| Germansen lake | 3,140 |

*Leases of W. C. Lesster and Associates.*—These comprise nine creek and nine bench leases, which include Holloway's bar and ground above and below this. At the time of inspection W. C. Lesster and C. Allen had just arrived for the purpose of continuing testing operations started last year with rocker. Unfortunately this year they lost their camp and all supplies in a bush fire and had to give up further work this season. Holloway's bar appears to consist of a depth of up to 10 feet of gravel on slate bed-rock. The area is quite extensive and systematic drilling would be required to form any approach to an accurate idea of yardage and values. Whether such is justified would depend upon the results of rocking operations. The latter are said to have indicated a value of 70 cents a cubic yard in places. There are also on these leases quite extensive deposits of high-lying bench gravels, representing post-glacial runs which offer possibilities which can only be determined by systematic testing. There might also be some hydraulic possibilities at some points.

*Leases of W. B. Steele and E. G. McCorkell.*—These leases are situated in between leases held by W. C. Lesster and associates. W. B. Steele and E. McCorkell have each one creek and one bench lease. The bench leases exemplify the hydraulic possibilities, like that of Ah Lock, on this river. W. B. Steele's bench lease is situated on the site of the old town of Nabum, some houses of which still remain. Some 40 feet above the river a bench of slate bed-rock is overlain by a thickness of upwards of 10 feet of gravels. These latter are again overlain by a thickness of 60 feet of boulder-clay, on top of which is a post-glacial run of gravel a few feet in thickness. The ground was at one time operated by W. Kenton and some piping was done, but it is understood that a great shortage of water was experienced. Various tunnels, now caved, have at some time been run into the bank, evidently many years ago. The lease adjoining up-stream is that of E. McCorkell. On this no work has been done, but the outcrop of slate and schist bed-rock at about the same level and similar topography strongly suggest that on this ground similar conditions will be found to those of W. B. Steele's lease. At the upper end of E. McCorkell's lease the sudden bend made by the river at this point suggests the possibility of a north-and-south run of gravel over this ground.

W. B. Steele is making preparations to install a small hydraulic plant on his property to operate both these leases. It is proposed to take water from creeks at the head of Slate creek, which flow into Germansen river, conveying this by ditch-line, which has already been constructed, leading to the top of the bench. The head available will be about 125 feet.

*Ah Lock's Bench Claim.*—This is situated about 3 miles below the above-described leases on the left bank of the river, about 4 miles above its mouth. Conditions are much the same apparently as those of W. B. Steele's lease. Pay-gravels are upwards of 10 feet in thickness and overlie a bed-rock bench of silicified sericite-schist. Gravel is overlain by upwards of 75 feet of boulder-clay, on top of which is a few feet of post-glacial gravel. Gold is both coarse and very fine, so that mercury is used in the block riffle sluice-flume. It occurs throughout the pay-gravel and in crevices in bed-rock. Pay-gravel extends for a river-frontage about 125 feet in length. Ah Lock, who has been in this section for the past forty years, installed, unaided, a small hydraulic plant consisting of penstock on top of the bench, 12-inch and 10-inch pipe, and monitor with 4-inch nozzle, and sluice-flume. He and his wife are the sole inhabitants of the old town of Germansen, which is situated about half a mile below his ground and where he raises garden produce for his needs. His method of working the ground is to pipe off the barren heavy overlie one year, during which he makes little or nothing, and the next year to pipe the pay-gravels. He states that in good years he makes between $10 and $14 per day.

*Tom Creek.*

This creek has in past years been very thoroughly and systematically worked, with satisfactory results. At the time of inspection W. McCormick was working on his placer lease and A. H. Hoffman was investigating some quartz veins.

*W. McCormick's Lease.*—At the point where the main trail crosses this creek the latter makes a sharp turn to the west, continuing its course through a canyon. A glacial deposit at this point strongly suggests that the older course of the creek was under this glacial deposit and more in line with the upper portion of the creek. It is also a reasonable expectation that such old channel will carry good gold values, as no gold was found apparently in the canyon. At the upper end of this old channel three Empire drill-holes were put down some time ago, the results of which are unknown. W. McCormick is running a tunnel at a point 100 feet vertically below the top of the glacial deposit to intercept the channel on the down-stream side. This tunnel at the time of inspection had been advanced a distance of 104 feet. Precise levelling would assist greatly in determining the most advantageous level for a tunnel. This is one of the many instances throughout this section where doubtless preliminary drilling would furnish much valuable information. Such means are, however, not available to the owner of this property. The length of the supposed old channel would be approximately 800 feet.

*Free Gold.*—This mineral claim, owned by A. H. Hoffman, is situated about a mile up-stream from the foregoing lease. On both sides of the creek small quartz veins are exposed in the banks. Some show some iron pyrites. Of four samples taken, one showed on assay traces of gold and silver; the others showed no values.

*Vital Creek.*

Lee Tong and associates are working an old channel of this creek at a point about 2 miles up from its mouth, at an elevation of 3,050 feet, where a very comfortable camp has been erected. The old channel lies below and north of the present stream. The exposed bank of glacial clay and gravels overlying the old channel is upwards of 300 feet in height. The former method of working was to utilize the modern stream-water at the higher level for ground-sluicing, a method which the great height of bank renders extremely dangerous and which can be no longer continued. The gold is in the form of extremely coarse well-worn flakes and is practically all on bed-rock and in crevices. Of the overlying gravel, only the bottom foot carries "pay." Drifting is clearly the best method of working and was about to be started at the time of inspection. Apart from the question of greater safety, the dilution caused by moving the entire overlie must have been enormous.

*Klawli Creek.*

This creek flows into Chuchi lake at the head of the Nation river. D. Purvis was prospecting on this creek during the year, but it was not possible to visit it.

*McConnell Creek.*

It is reported that P. Jensen has been working on McConnell creek (a tributary of the Ingenika river, at the head of the latter), with satisfactory results, for some years past. It was quite impossible to visit this creek during the year. A full account of this creek will be found in the Annual Report for 1908, page 66. Although McConnell creek is not in the Manson section, it is here referred to.

FORT GRAHAME SECTION.

A full account of the topographic and geologic features of this section, means of access, and properties mentioned herein will be found in the Annual Report for 1926.

Considerable activity took place in this section during the year. Development was carried on at the *Ferguson* lead mine (formerly *Trout Lake* group) by the Selkirk Mining Syndicate, Limited, and at the property of the General Holding Company, Limited, which company also made a small shipment of mica amounting to 700 lb. in weight. A reconnaissance geological survey was made by Victor Dolmage, of the Geological Survey, and the *Ferguson* mine was inspected by J. M. Turnbull.

*Ingenika River.*

**Ferguson.** Particulars of this property will be found under *Trout Lake* group in the Annual Report for 1926. A force of ten men has been employed at this property by the Selkirk Mining Syndicate, Limited, in development, which will be continued during the coming winter.

Vital Creek, Omineca M.D.

Flint Creek, Skeena River.

Tahtsa River, Omineca M.D.

Seel Mountain, Tahtsa River, Omineca M.D.

*Mica Mountain.*

**General Holding Co., Ltd.**

This company employed a force of about ten men at its mica property on Mica mountain from June until September, when operations were suspended for the winter. The manager, Gordon F. Dickson, has kindly supplied the following particulars of operations: "Original intention was to confine operations almost entirely to opening up the vein from the raise at a depth of 60 feet below the surface, but after driving for about 20 feet on the vein we struck such a heavy flow of water that it was impossible to continue. I then formed two new camps, one on Low (east) Mica mountain and one on High (west) Mica mountain, and from workings at these places about 2½ tons of mica was extracted, which was cut before being brought out and reduced to about 700 lb. and shipped to Edmonton."

The manager further states that he is of the opinion, and is so advising his directorate, that the expense of *seasonal* operations only is too great, and that arrangements should be made to carry on work throughout the year continuously. Shipments of mica would be made when supplies were brought in during the open season. A full account of this property will be found in the Annual Report for 1926.

*Ravenal.*—(*See also* Annual Report for 1926.) The owner, H. Ravenal, reports having worked at his property during the year.

COAL.

This year shows a satisfactory increase in the output of coal, the market being greatly stimulated by an early and severe winter. The output from the Goat Creek Colliery of Telkwa Collieries, Limited, amounted to 1,671 long tons, as compared with 1,260 long tons in 1926.

**Telkwa Collieries.**

This company maintained a small force of men at its Goat Creek Colliery, mining sufficient coal to supply the market and improving haulage-ways in the mine. A full account of this colliery will be found in the Annual Report for 1926. Aid was given by the Department of Mines in improving the motor-road from this colliery to Telkwa, a distance of 5½ miles.

*Seaton Coalfield.*

This coalfield is described in the Annual Report for 1916 as the Wright Coal Company (Seaton). A careful investigation of this coalfield was carried out by the Bulkley Valley Coal Mines Syndicate under the direction of Francis Glover. This comprised not only prospecting, but actual mining operations to make trial shipments. Seaton is a flag-station on the Canadian National Railway, about midway between Hazelton and Smithers. The railway passing through the coalfield affords ideal transportation facilities.

The area of the basin is in the neighbourhood of 4 miles long by 3 miles wide, and the Bulkley river, cutting down deeply through the coal-measures, affords an excellent exposure of the latter. They belong to the Skeena series of Cretaceous age and consist of grits, conglomerates, sandstones, and shales, striking about N. 67° W. (mag.) and dipping north-easterly at about 30°. A feature of these measures is the very large number of small seams of coal, up to about a foot in width, which occur at intervals of about every 25 feet. So far no very wide seam has been found and unfortunately a very high ash content is a characteristic of the seams so far discovered. However, it is quite possible that a seam offering more hopeful commercial promise will yet be found. Francis Glover was of the opinion that the coal yielded an unusually dense coke and a market for such might warrant washing. One feature this coalfield does possess—namely, a large *undisturbed* area—augurs well for continuity of the seams. The Bulkley Valley Coal Mines Syndicate employed three men in actual mining operations.

The main seam, known as No. 1, which was opened up originally some years ago by a drift from the river-level and a slope from the top of river-bank connecting with this tunnel, is fully described in the Annual Report for 1916. During the year the tunnel was driven ahead 45 feet and the slope cleaned out from the surface downwards. In the face of the tunnel the seam is 4½ feet wide, but is split up by bands of bone. A sample of clean coal only, gave the following analysis: Moisture, 1.8 per cent.; V.C.M., 17.7 per cent.; F.C., 36.7 per cent.; ash, 43.8 per cent.

In another seam, about 400 yards west of the above, known as No. 2 seam, a drift has been run 15 feet. This seam is 17 inches wide. A sample gave the following analysis: Moisture, 3 per cent.; V.C.M., 21.2 per cent.; F.C., 59 per cent.; ash, 16.8 per cent.

In a third seam, known as No. 3 seam, 3 feet in width, of which 28 inches is coal, a drift-tunnel was run a distance of 70 feet. The intention was to make a trial shipment from this seam and a large portion of this had been sacked at the time of inspection. A sample of the sacked coal gave the following analysis: Moisture, 1.4 per cent.; V.C.M., 19.5 per cent.; F.C., 43.4 per cent.; ash, 35.7 per cent. A shipment of 20 tons was actually made.

No test of burning qualities was made by the writer, but coal with such a high ash content as that shown by Nos. 1 and 3 seams could hardly be marketed without prior washing. No. 2 seam is very much lower in ash and affords some basis for hope that commercial seams will yet be found in this coalfield.

*Zymoetz (Copper) River Coalfield.*

Some prospecting was done on this property during the year by F. B. Chettleburgh, the agent of the Yorkshire and Pacific Trust Company, which now controls ownership. A description will be found in the Annual Reports for 1914 and 1922.

In view of the interest shown in the coalfields of this Mineral Survey District, it is deemed desirable to repeat the list of various reports given in the 1924 Annual Report:—

| Name. | Annual Report. |
|---|---|
| Groundhog coalfield | 1911, 1912. |
| Bowron River coal area | 1914. |
| Zymoetz (Copper) River coalfield | 1914, 1922. |
| Prince Rupert Coalfields Co. | 1917. |
| Lake Kathlyn coal property | 1917, 1926. |
| Wright Coal Co. (Seaton coalfield) | 1916. |
| Aveling coal property | 1921. |
| Fraser Lake coal | 1921. |
| Cedar Creek coal property | 1922. |
| Telkwa Collieries, Ltd. | 1920, 1923, 1926. |
| Peace River coalfield | 1923, 1926. |
| Quesnel-Alexandria coalfield | 1923. |

The coalfields of the Skeena, Bulkley, and Telkwa rivers were examined by W. W. Leach, of the Geological Survey of Canada, during years 1904 to 1910. Refer to Geological Survey Report, 1907, "The Telkwa River and Vicinity," by W. W. Leach.

The Groundhog coalfield is described at length by G. S. Malloch in the 1912 Summary Report of the Geological Survey of Canada.

The Peace River coalfield is fully described by F. H. McLearn in Geological Survey of Canada Summary Report, Part B, 1922.

## PEACE RIVER MINING DIVISION.

It was not possible to visit this Mining Division during the year, but it is believed that no important activities took place. A very full account of it will be found in the Annual Report for 1923 and further information in the Annual Report for 1926.

## CARIBOO MINING DIVISION.

The placer production of the Cariboo Mining Division for the year was $53,125, as compared with $170,993 for 1926.

This falling-off is due mainly to the fact that the Kafue Copper Development Company's dredge made practically no production, as it was engaged in digging its way back from Antler creek to the company's new area on Cunningham Pass creek. Prospects are better for 1928, inasmuch as the dredge will resume production this year, and the principal hydraulic mine, John Hopp Mines on Lowhee creek, after several lean years, appears to have every prospect of better times ahead. Moreover, the smaller hydraulic operators continue ever on the alert; each year witnesses some new activity and the sum total of their individual contributions is very appreciable.

Systematic drilling in Barkerville section was carried out by General F. A. Sutton and by G. A. Dunlop.

### Mount Robson Park.

Some showings of galena were examined in the Selwyn range, south of the Yellowhead pass, in Mount Robson park. Unfortunately there was not disclosed any evidence of commercial possibilities. These showings are reached from Grant Brook flag-station on the Canadian National Railway in the Yellowhead pass and lie south of the Fraser river.

The Selwyn range in this vicinity consists of greenish-grey schists at the base overlain by beds of schistose quartz conglomerate, several hundreds of feet in thickness. Overlying these and forming the tops of the mountains are cream-coloured limestone-beds. These are classed by the Geological Survey of Canada as belonging to the Bow River series of Lower Cambrian age.

**Yellowhead.** This group, owned by J. Atkins, is situated in the Selwyn range on the south side of the Fraser river, which is crossed by boat near Grant Brook Station. The property is distant about 4 miles by trail from Grant Brook and is situated at an elevation of about 6,000 feet.

The quartz-conglomerate beds strike east and west and dip at a small angle southerly, their outcrops forming practically horizontal lines on the mountain. The beds develop at some points quartz veins which strike in almost every direction. These vary in width from 1 inch to 3 feet. The widest veins appear to follow the bedding-planes and as far as observed are quite barren. The veins, which are more or less vertical and which vary in width from 6 to 18 inches, show a slight mineralization of galena and a very little copper pyrites. All veins are tightly frozen except the vertical ones, which are free at the surface, possibly due to the fact that the conglomerate-beds are disintegrating in enormous masses and the vertical fractures form lines of weakness. The foregoing describes the occurrence at the main exposure at an elevation of 6,050 feet.

A sample of selected mineral assayed: Gold, trace; silver, 2.2 oz. to the ton; lead, 5 per cent. These showings have no commercial possibilities and unfortunately the surrounding geology is not indicative of lode-mineral promise.

**Spider and Eagle.** These claims, owned by M. Salk, lie in the Selwyn range, about 4 miles west of the *Yellowhead* group, at a somewhat lower elevation. The claims are reached from Moose lake, from the south shore of which they are distant by trail 1½ miles. At elevations of between 4,550 and 4,650 feet the quartz conglomerate develops small quartz veins. At each of two different places a vein 6 inches in width was well mineralized with galena and a little zinc-blende. A sample of selected mineral assayed: Gold, trace; silver, 10.5 oz. to the ton; lead, 62 per cent.; zinc, 1 per cent.

Although mineralization in these small veins is better than that described at more easterly points, no commercial possibilities are indicated.

Prospectors living in and near the Yellowhead pass are advised to devote some attention to Mica mountain, which lies just west of the Rocky Mountain trench, near Tete Jaune. Prospects of finding, at any rate, mica of commercial grade reasonably close to transportation appear to be very good. Refer to Annual Report for 1920. James McEvoy, of the Geological Survey of Canada, in 1898 also reported at that time that the mica was of excellent grade and prospects of finding commercial deposits good.

### Prince George Section.

#### *Hixon Creek.*

Hixon creek, the scene of activity in early Cariboo history, is well worth close examination. A wagon-road leads off the main Prince George–Quesnel road, about midway between these places, by C. H. Colgrove's ranch, continuing up the creek for about 6 miles. At this point are the leases of B. Briscoe and of E. Hann and J. Strbac, on which activity centres at present.

About three-quarters of a mile above the junction of Government and Hixon creeks are falls on the latter about 90 feet in total height, the drop being in three steps. At this point the country-rock exposed is augite syenite (*see* Memoir 118, Geological Survey of Canada). From this point onward as far as the upper end of B. Briscoe's lease (with exception of an outcrop of augite syenite about three-eighths of a mile above the falls), a distance of about 3 miles, the country-rocks on both sides of the creek are sericite-quartoze schists with occasional bands of black shale. On Hann & Strbac's lease biotite-schist appears, and some distance higher up granite. Quite possibly the biotite-schists are sheared Pre-Cambrian granite. The sericite-quartz schists appear

to weather and kaolinize readily and leave a residual clay of characteristic salmon-pink colour. These schists enclose numerous quartz veins, which are revealed in the clay in the form of angular and numerous pieces of quartz. Kaolinization renders it difficult at times to distinguish between "rock in place" and a slide of this rock, which may have kaolinized before or after sliding. Both may contain and at certain points do contain *residual* gold in noticeable quantity. The biotite-schist which appears to underlie Hann & Strbac's lease would kaolinize to a white clay, so that the white clay on that property is quite possibly residual and not formed by water, although evidence is somewhat scanty on that point.

At several points on the creek-banks there are auriferous terrace gravels. Likewise at certain points the decomposed surface rock contains a noticeable quantity of residual gold, for example, on the property of the Quesnelle Quartz Mining Company and quite possibly in other places. The creek gradient is unfortunately low, about 100 feet of fall to the mile. The creek-gravels also appear to contain a number of large boulders at some points. Quite possibly some of the terraces offer hydraulic possibilities. Further investigation followed by drilling would be necessary to determine this.

*Lease of E. Hann and J. Strbac (Placer Lease No. 2118).*—This lease adjoins that of B. Briscoe up-stream and is about 1½ miles above the old stamp-mill of the Quesnelle Quartz Mining Company. Refer also to Annual Report for 1926.

On the left bank of the creek a small pit has been opened up by ground-sluicing, the dimensions of which are about 100 by 120 by 10 feet deep. This pit shows immediately underlying top soil and vegetation a thickness of 6 feet of silt and sand, which is barren. Under this is 4 or 5 feet in thickness of gravel and large boulders, in which coarse gold is found. Immediately below this is a white clay which contains coarse flakes of muscovite and in which coarse gold also exists. The floor of this pit is only a foot or so above the creek-level; consequently only the top foot or so of the white clay can be ground-sluiced, and the rich overlying gravels are being followed away from the creek. On the western edge of the pit a shaft, now full of water, is stated to have been sunk to a depth of 32 feet, of which the upper 10 feet was sand and gravel as shown in the pit; then followed 2 feet of white clay; then 20 feet of clay and decomposed white quartz; and finally the salmon-pink decomposed schist was struck. It is stated that of the 22 feet of decomposed clay and quartz, only 4 feet was quite barren; fine gold was found in the upper portion and the bottom 2 feet showed fairly coarse gold. About 150 feet down-stream from this shaft very rich "pay" was struck on the surface to a depth of about 3 feet. Within an area of 40 feet square gold to the value of $500 was recovered. A shaft was sunk through the surface gravels, 3 feet in thickness, for a further distance of 18 feet, of which the upper 16 feet was the characteristic salmon-pink decomposed rock and the bottom 2 feet was in the white clay.

It seems likely that this white clay is *residual* resulting from kaolinization of the biotite-schist, which outcrops at two points below the lower shaft and at higher points on this lease. It is not easy to explain the presence of *alluvial* gold in this clay at such a depth below the surface as the owners state was the case in the shaft. The gold might, of course, be, and possibly is, *residual* gold. The gold seen by the writer in the overlying gravel is coarse creek gold, which does not appear to have travelled far. On this property a considerable distance up-stream is a larger bench, possibly a quarter of a mile long and 300 feet wide, which has not been thoroughly prospected, but which offers possibilities. This year the owners cleaned up 50 oz. gold from the small area worked. Some drilling on this property would doubtless clear up many points. The property merits close investigation.

*Lease of B. Briscoe.*—As already mentioned, this lease adjoins that of Hann & Strbac down-stream. The owner, B. Briscoe, has done much work on his property during the year and has gone to very considerable expense in the way of plant. He has installed an 8-ton 50-horse-power steam-tractor, a 2-stage centrifugal plant of capacity 1,400 gallons a minute, used as a monitor pump, a sawmill, and gasoline-driven hoist. He has also constructed a dam across the creek and about 440 yards of 18-inch by 16-inch flume therefrom to deliver wash-water. After some preliminary piping of some 3 feet of surface gravels which overlie the salmon-pink coloured decomposed rock on the right bank, B. Briscoe formed the opinion that a glacial moraine trending north and south, one end of which is exposed at the upper end of this lease, was the means of diverting the creek to its present channel from a more northerly channel previously occupied. He further formed the opinion that the decomposed rock showing in the creek-bank was slide-

rock and not in place. A shaft was sunk, said to be 50 feet deep, in this decomposed rock, but owing to flow of water at this point it could not be continued and was full of water at the time of inspection. It was stated, however, that there was evidence of auriferous gravel just at the time water was struck. Another shaft was sunk close to the first and subsequent to inspection the owner states that, owing to very severe weather after sinking to 50 feet and getting indications of auriferous gravel, operations had to be suspended until the spring of 1928. Even granting that a former channel exists somewhat north of the present channel, the question of its gold content is another matter altogether, and it seems unfortunate that preliminary Keystone-drilling was not the first expedient adopted by way of investigation. In sinking in this salmon-pink rock it must be borne in mind that a sudden change to the white clay resulting from kaolinization of the biotite-schist is to be expected. Such change might conceivably be mistaken for creek-gravel.

It is worth noting that B. Briscoe himself brought the 8-ton tractor on the ground under its own steam over a road which might be described as impassable for cars, undoubtedly a noteworthy accomplishment. He subsequently showed much energy and no small amount of ingenuity in putting his own ideas into effect.

*Leases of A. J. Hurtubise.*—These are situated on George creek, a tributary of the Willow river, and work was done on them during the year by the owner. Time did not permit of inspection.

A large strip of ground between the Willow and Fraser rivers from Ahbau lake northwards appears to be promising and well worth prospecting and investigating for placer.

### *Government Creek.*

**Pioneer.** This group (formerly *Rush* group, under which name refer to 1926 Annual Report), owned by T. Rush, H. J. Ewing, W. Bonner, and J. Peters, is situated on Buckley creek, a tributary of Government creek. It is reached by a short branch road and trail from the main Prince George–Quesnel road. During the year a shaft was sunk to a depth of 30 feet at a point about 30 feet east of the adit-tunnel previously run. This shaft followed downward some mineral showing on the surface, but was full of water at the time of inspection. The mineral occurrence on this property is a quartz vein, mineralized with galena and zinc-blende. The enclosing country-rock is a carbonaceous shale, through which the small creek has cut down somewhat deeply. The vein strikes from N. 60° W. to N. 70° W. (mag.) and dips north-easterly. On the north side of the creek, owing to the strike and topography, the vein can only be followed by sinking. On the south side of the creek it can be followed by adit-drift, and during the year, in addition to the sinking mentioned, an adit-drift was run a distance of 40 feet on the vein on the south side of the creek, which disclosed a somewhat sparse mineralization. It is stated that the shaft mentioned disclosed some mineral from which a shipment of 1 ton was made. This was taken out to the main road by pack-horses; then conveyed by motor-truck to Prince George and shipped to the Trail smelter.

The owners of this group also did some work at a point on Government creek, below the junction of Buckley creek with the latter, on the left bank.

## Barkerville Section.

In Memoir 149, by W. A. Johnston and W. L. Uglow, published by the Geological Survey of Canada in 1926, entitled "Placer and Vein Gold Deposits of Barkerville, Cariboo District, British Columbia," will be found a detailed account of practically every such deposit in this section. To this report reference is particularly invited.

### *Antler Creek.*

*Kafue Copper Development Co.'s Dredge.*—This company's dredge was engaged practically all the year in digging its way back from Antler creek to Cunningham Pass creek, the new dredging area, and consequently did not figure appreciably in production.

*Consolidated Mining and Smelting Co. of Canada, Ltd.*—This company employed a small force of men in restoring the old workings on the H. E. C. Carry leases on upper Antler creek. These workings are in the old buried channel in the right bank of the creek and comprise a tunnel somewhat over 700 feet in length, near the end of which a shaft from the surface was

formerly sunk a distance of 60 feet, connecting with the tunnel, thus affording ventilation. The shaft and a portion of the tunnel which had caved some years ago were being restored at the time of inspection. It was stated that when this had been done it was the intention to continue driving in the channel up-stream. R. B. Shelledy is in charge as superintendent.

*Lease of P. M. McLamders.*—This lease is situated on California gulch, a tributary of upper Antler creek. The owner has been engaged all the season in making preparations to hydraulic the creek in 1928. A road half a mile in length has been constructed from China creek; 500 feet of 26-inch, 11-inch, and 9-inch pipe and a No. 2 Monitor have been taken on the ground; penstock and ditch-line have been constructed; and piping area brushed off in readiness. Water is to be taken from Wolfe creek and Stevens gulch. A comfortable cabin has also been erected on the ground. Everything is in readiness for an early start in the spring.

*Guyet Lease.*—This lease is situated on the right bank of Antler creek, about three-quarters of a mile above Pleasant Valley creek, and is owned by J. Wendle, C. M. Edwards, J. H. Clegg, and L. E. R. Booth. Further particulars will be found in the Annual Report for 1926. As the result of operations from inception to date the owners decided that results were sufficiently encouraging to warrant further expenditures in improving the water system. On this, subsequent to the spring run, efforts were concentrated. The 4 miles of ditch-line bringing water from Cariboo creek were enlarged and 1,500 feet of new pipe-line (30-inch to 9-inch at the monitor) and new penstock were installed. With this new installation the head at the top of the pit is 135 feet and at the bottom 245 feet.

The face of the pit shows in descending order the following strata: 15 feet of glacial drift; 8 feet of boulder-clay; 40 feet of chicken-feed; 30 feet of slum; 10 feet of chicken-feed; 6 feet of pay-gravel. The character of the pay-gravel changes from broken bed-rock at the mouth to gravel at the face. The proposal is to set up the monitor at the top of the pit first and pipe off the 15 feet overlying the boulder-clay, which latter can then be cut up more readily by the monitor stream.

### *Cunningham Creek.*

*Trehouse Hydraulic.*—This property, owned by F. J. Tregillus and J. House, has been operated during the year by the owners, with, it is understood, distinctly satisfactory results. A description will be found in the Annual Report for 1924.

### *French Creek.*

Preparations were made during the year by F. A. Sutton and J. Wendle to hydraulic this creek, a north-easterly flowing tributary of Pleasant Valley creek. A full description of early work on this creek will be found in Memoir 149 of the Geological Survey of Canada. This creek heads close to the upper part of Conklin gulch, where a number of shafts at the summit appear to indicate a run in the direction of French creek, which was recognized by early workers and sought for by them.

A certain amount of drilling was done in the lower part of the creek during the year by the present operators. Present plans embrace bringing in water for hydraulicking from Grouse creek, making use of a natural reservoir situated between French and Canadian creeks. A ditch-line for utilizing water from French creek was under construction at the time of inspection, situated at a point about 135 feet above the southern edge of the valley. It is estimated by the operators that sufficient grade for sluice-flume is given for disposal of tailings into Pleasant Valley creek from this point downwards. When the creek bed-rock is reached the grade of this should be quite satisfactory. The ranch at the mouth of the creek in Pleasant valley has been acquired by F. A. Sutton.

### *Lowhee Creek.*

*Lowhee Hydraulic.*—This, the chief hydraulic mine in the district, experienced favourable results during the year and there is every indication that the pit is now in virgin ground, which the early bed-rock miners were unable to reach. A productive period of some years' duration seems probable from now onward.

### *Emory Gulch.*

On Emory gulch, a tributary of Stout's gulch, D. McIntyre on a "lay" from John Hopp experienced a good season.

*Shepherd Creek.*

*Leases of R. D. Rees.*—Refer to the Annual Report for 1926. R. D. Rees made a discovery this year on his property which may prove of significance, although as yet it has not been followed up sufficiently far to form any definite conclusions. At the top of the left bank of Shepherd creek, about 2,000 feet east of and 65 feet above R. D. Rees's present workings, a pit sunk shows evidence of a channel trending in a north-westerly direction from this point, through which the more modern Shepherd creek has cut down. The owner reports values of about 45 cents a cubic yard in the gravel and is making further investigation. The ground northwards to 8-Mile lake offers much promise on which doubtless drilling would throw much light.

*Devil's Lake Creek.*

*El Dorado.*—For a description *see* the Annual Report for 1926. After drilling two Keystone-drill holes in the channel above the lake, the results of which it is understood were of a negative character, the owners suspended further draining of the lake.

*Slough Creek.*

The *Ketch*, at the mouth of Devil's Lake creek, and the *Point* and Wong Sing Wong (the last two mentioned being Chinese companies) experienced satisfactory seasons. Further mention of the *Ketch* will be found in the Annual Report for 1926. It is understood that an option on this property has been acquired by the Consolidated Mining and Smelting Company of Canada, Limited.

*Dragon Creek.*

A creek lease here is owned by L. Ford and R. McDougall. Much work was carried out this year in preparation for next season's operations. The proposal is to hydraulic the virgin ground on the lower end of the creek below the old workings which were the result of operations in 1902 by Gust. Lange.

The present operators two years ago ran a tunnel 520 feet in length, in the region mentioned, to intercept the buried channel, which was mined over a width of from one to three sets and for a length of 100 feet. The ground, it is stated, averaged about 1½ oz. to the set. A raise was put through to the surface at the end of the tunnel, the length of the former being 52 feet. The length of pipe-line (26-inch to 15-inch) will be 1,700 feet from the dam-penstock on Dragon creek to the No. 6 Monitor. Piping will be started, of course, below the tunnel and at such a point that the sluice-flume advanced on a grade of 6 inches per box (12 feet) will be on bed-rock at the end of the tunnel. The length of flume as shown by survey will be 1,100 feet. The dimensions will be 40 inches wide by 36 inches deep.

This is a case where the owners have not made the mistake of embarking on a campaign of expenditure without first gaining, at any rate, some kind of evidence as to the value of the objective. The values of bed-rock gravels as shown by such drifting as was carried out appear to lie between $4 and $5 to the cubic yard, assuming 8-foot caps to the sets. Doubtless the overlying gravels carry small values.

Dragon creek is a tributary of Willow river, and this property is reached by a branch road about 5 miles in length which leaves the main Quesnel-Barkerville road at the mouth of Devil's canyon.

*Lightning Creek and Tributaries.*

**Cariboo Eagle Mining Co., Ltd.** This company, a limited liability partnership, is operating leases on Houseman (Eagle) creek. Work done during the year, besides piping, comprised the construction of a reservoir 150 feet in length by 10 feet in depth by 12 feet in width at the outlet of two small lakes which are situated about 100 feet vertically above the penstock. A flushing-dam was also constructed. Further particulars of this property will be found in the Annual Report for 1926.

*Perkins Gulch.*—I. I. Felker and W. S. Sparkes own two creek leases from the mouth upwards and have for some years been hydraulicking at two points, an upper about half a mile above the creek-mouth and a lower near the mouth.

At the upper point the pit is at an elevation of 4,400 feet and water is used from Perkins gulch, which unfortunately does not furnish a good supply. It is stated that from this pit during the past seven years a total quantity of gold to the value of $25,000 has been recovered.

This pit exposes somewhat east of the modern creek, and between 30 and 40 feet above it, a buried channel 100 feet or so in width and somewhat above it a bench of about the same width. Both terrace and main channel show pre-glacial runs of gravel on bed-rock, but the latter exemplifies also a post-glacial run of auriferous gravel overlying boulder-clay. This channel appears to trend about N. 15° E. and is well worth close investigation. It is stated that in places it was rich.

The lower pit is near the mouth of the creek and water for it is available from Amador creek, from which a mile of ditch leads to a penstock at 4,330 feet elevation. The possibility of a high run parallel to Lightning creek at the lower end of Perkins gulch was recognized by the early miners and is referred to in Memoir 149 of the Geological Survey of Canada. Persistent search has so far failed to find this run, which may yet be disclosed.

*Amador Creek.*—I. I. Felker and W. S. Sparkes own three creek leases from the mouth upwards. For about a quarter of a mile up from its mouth the creek is steep, thereafter the creek flattens and for about 1¼ miles occupies a valley from 100 to 200 feet in width. Whether it offers hydraulic possibilities can only be determined by drilling. It seems a reasonable speculation to drill, at any rate, a few holes by way of preliminary. A Keystone drill can be got on the ground with the greatest ease, as the old road which formerly ran from Stanley to Barkerville crosses the lower portion of the creek and will be repaired as far as Houseman creek in all probability during the coming season. Should drilling disclose satisfactory results, the present ditch conveying water from Amador creek to Perkins gulch could be used and another old ditch could be repaired and used to bring water from upper Lightning creek.

*Ah Quay.*—This claim, owned by J. F. Williams, is situated on the left bank of Lightning creek, between Last Chance and Anderson creeks. The face of this pit shows an interglacial run of gravel 6 to 8 feet in thickness, which underlies boulder-clay and overlies slum, which latter lies on bed-rock. Another distinctly unusual feature is that of a stratified boulder-clay, small subangular fragments of country-rock showing distinct stratification in the clay.

*Last Chance Creek.*—The hydraulic on this creek owned by Kwong Lung Kee and associates was operated throughout the season, but work was considerably hampered by boulder-clay and production was low in consequence.

*Donovan (Poorman) Creek.*—This creek flows into Lightning creek from the south, almost directly opposite Timan creek, about 6 miles below Stanley. Two bench leases at the head of the creek are owned by Magnus Sundberg, who last year made a new discovery. The old hydraulic pit ran out of "pay" towards the head of the creek, but last year the owner discovered what is apparently the main run of the creek, lying considerably above the old pit on the west side. This has since been followed and found to be rich, the owner cleaning up somewhat over 200 oz. this year, with every prospect of further continuation. Credit is to be attached to this discovery, because there was a pronounced left-hand rim in the old pit, which forms the right rim of the newly discovered channel, which might have reasonably discouraged search on this side. What appears to be the left rim of the new channel is also exposed. A thickness of about 5 feet of pay-gravel on bed-rock is overlain by glacial silt, gravel, and slum. The gold is characteristic creek gold, coarse, worn, and nuggety, with quartz attached. The owner expects to employ a force of about six men during the coming season and has established a comfortable camp close to the pit.

### *Anderson Creek.*

E. M. Falck has been working on this creek during the year and expects to install a small hydraulic plant during the coming season.

### *Upper Swift River.*

A wagon-road, the first few miles of which merge into a pack-trail, leads from Stanley to the Swift river somewhat below the junction with it of Little Swift river; the distance is about 16 miles. Below the confluence mentioned Swift river flows through a wide sparsely timbered valley for some miles. Fountain creek flows south-westerly across this wide valley to its junction with Swift river at a point somewhat over half a mile below the confluence of Swift and Little Swift rivers. Dredging possibilities of such a wide expanse of valley have at various times been the subject of interest, and it is stated that some holes were drilled some years ago, but the exact results are not known.

J. F. Williams owns three leases of Fountain creek from the mouth upwards, of which the uppermost has hydraulic possibilities, which are described in the Annual Report for 1917. As to the dredging possibilities of the two lower leases, it is stated that fairly coarse colours of gold can be obtained by panning bars on the Swift river. Such, of course, may be purely superficial and, in the absence of drilling, dredging possibilities must remain largely a matter of conjecture.

*Lower Swift River.*

**Gold Dredging Syndicate, Ltd.**

A full description of this property will be found in the Annual Reports for 1924, 1925, and 1926. A further attempt, of very short duration, was made this year to elevate gravels by means of a steam-ejector. The Resident Engineer visited the dredge this year, but operators had just left. It is unfortunate that a standard type of dredge was not installed on this ground in the first instance. This area lies only 2 miles from the main road; the branch road therefrom is practically level and the total distance from rail-head is only 25 miles. Shallow gravels of a maximum depth of 25 feet, clay bed-rock, few, if any, large boulders, and local wood fuel are all factors which should contribute to a low dredging cost.

*Lower Lightning Creek.*

*Lightning Creek Gold Gravels and Drainage Co., Ltd.*—An excellent résumé of this company's operations from the earliest times to 1923 will be found in the Annual Report for that year. Since that time no mining of the deep gravels has been carried on.

Sale of the property by public auction was ordered in Supreme Court on December 20th, 1926, by Justice W. A. Macdonald, the same to take place on June 7th, 1927. By subsequent order of the Court this sale was stayed *sine die* and a receivership committee of three persons appointed, with power to operate the property.

Among small-scale operators may be mentioned W. C. Slade, who constructed a useful foot-bridge across Lightning creek by the old *Bonanza* mine and did work on his lease in this vicinity.

*Beaver Pass.*

In the fall of 1926 Keystone-drilling operations under the management of A. Wallinder were commenced in this valley (*see* Annual Report for 1926), but for reasons which are not known only two holes were drilled in the valley, one at a point 1½ miles from Beaver Pass House to a depth of 80 feet and the other 2½ miles from the same place to a depth of 70 feet. Further facts as to these holes are unknown. Two holes would not give conclusive evidence as to the dredging possibilities of this valley. If the depth to bed-rock were known it would throw some light on the question as to whether Lightning creek originally flowed north-westerly along this valley.

KEYSTONE-DRILLING.

F. A. Sutton, having optioned various properties and established a base camp in Pleasant valley, commenced a drilling campaign, of which H. B. Barnett was in charge, with A. Brown conducting actual drilling. Various holes were drilled in Pleasant valley between Weldon lake and the mouth of French creek, with, it is understood, negative results as to any dredging possibilities in this region. The drill employed for holes up to 60 feet was a Type A Union Construction Company's drill, operated by an 8-horse-power gasoline-engine and employing standard 4-inch pipe, a very mobile drilling-rig for prospecting. It is understood that drilling in Valley creek (or Big Valley, as it is commonly known) is to be started in the spring of 1928.

G. A. Dunlop, acting on behalf of San Francisco interests, completed a drilling campaign started last year on Pine and Summit creeks, and which, he states, proved in that region four and one-half million cubic yards of gravel of dredging value.

Some drilling was also carried on at the *El Dorado* on Devil's Lake creek, previously mentioned under that heading in this report.

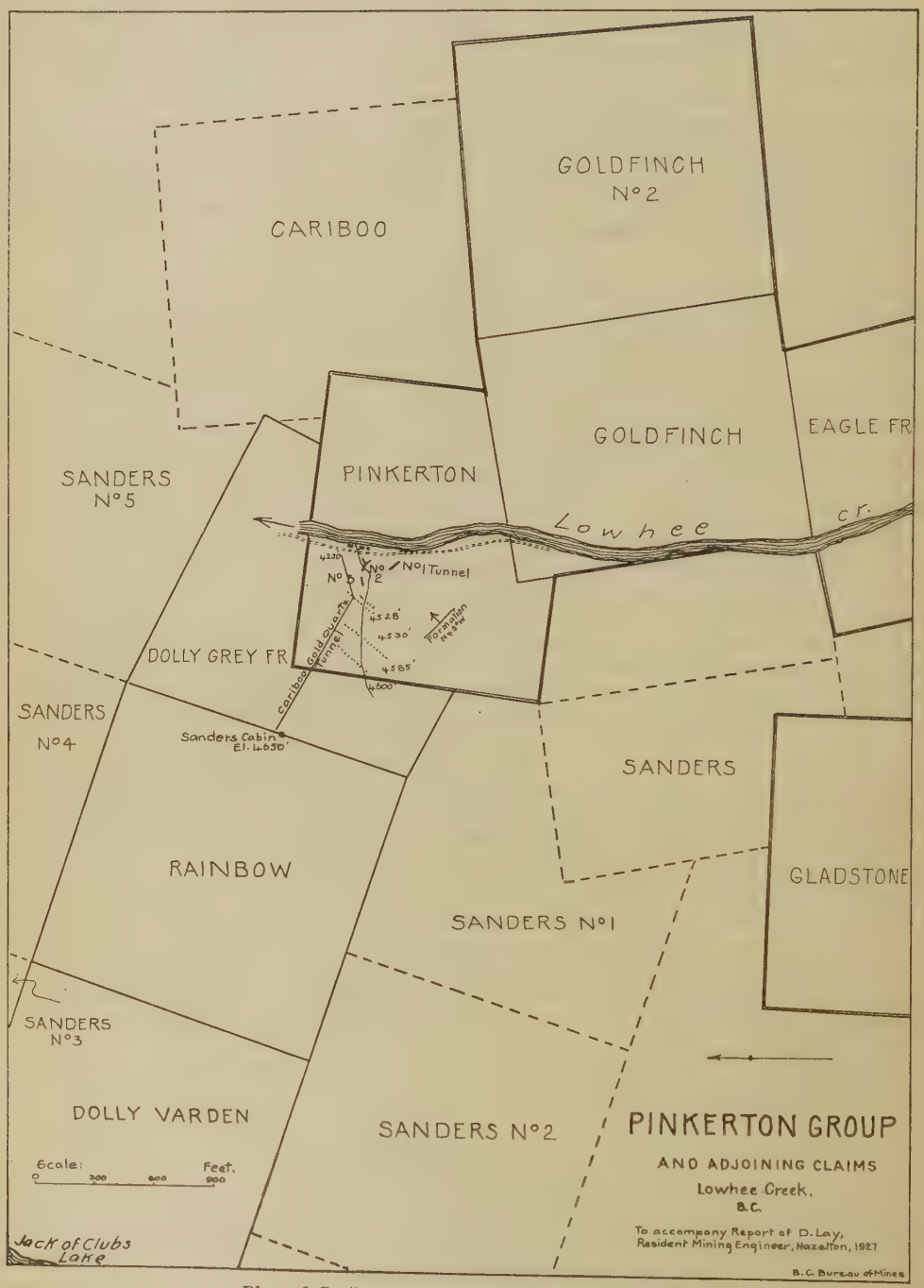
LODE-MINING.

*Cow Mountain.*

**Cariboo Gold Quartz Mining Co., Ltd.**

The aim of this company it to probe in depth quartz veins showing high surface values. The plans adopted involve the running of a crosscut tunnel from the left bank of Lowhee creek at an elevation of 4,250 feet for a distance of somewhat over 1,000 feet, the main objective being the penetration of the vein system of the *Rainbow* group. The veins of the latter show high surface

values at 4,650 feet elevation. From this main crosscut a branch may be run to penetrate any veins nearer the portal whose outcrops show good values. In the area south of the tunnel portal, where surface prospecting is being carried on, it is evident that in the early days a considerable amount of ground-sluicing was done and doubtless some residual gold recovered. A sample taken across one such vein uncovered by this company, representing a width of 3 feet, assayed: Gold, 0.84 oz. to the ton; silver, 0.16 oz. to the ton.




Plan of Cariboo Gold Quartz Mining Company.

Suitable camp buildings have been erected by the portal of the tunnel to accommodate a small force of men and a small air-compressor has been installed, which is operated by a Ford tractor. The latter serves for other duty, such as hauling wood, when compressed air is not required. Owing to loose and shattered country-rock near the surface it was found advisable to commence the crosscut by hand. As the rock gets more solid a compressed-air drill will be employed. J. W. Walker is superintendent. The results of this work will be awaited with much interest. An account of the *Rainbow* group will be found in the Annual Reports for the years 1924 and 1925.

*Island Mountain.*

C. J. Seymour Baker had a small force of men engaged for a few weeks in clearing out old tunnels on his property on Island mountain.

*Hardscrabble Creek.*

*Hardscrabble Scheelite-deposit.*—This property having reverted to the Government, a lease on it was obtained by C. J. Seymour Baker, who states that he repaired the shaft and took about 400 lb. of ore for the purpose of analysis and tests to determine a method of extraction. An account of this property will be found in the Annual Report for 1918.

*Cunningham Creek.*

Further work was done during the year on the *Hudson* group, owned by E. Moore, and on the *Homestake* group, owned by J. H. Campbell and J. P. Delhanty. An account of these properties will be found in the Annual Report for 1925.

## QUESNEL MINING DIVISION.

The placer production of the Quesnel Mining Division for the year was $39,423, as compared with $121,535 in 1926; a marked decrease, due mainly to the greatly reduced production from Cedar Creek Mining Company, Limited, and to the fact that the *Kitchener* hydraulic mine had no "clean-up," for reasons, it is stated, which are not connected with its powers of future production.

A better production is expected next year, as an extensive drilling campaign was undertaken on Cedar creek, which it is stated indicated hopeful results.

### Quesnel Section.

*Deposits of Diatomite.*

An examination of these was made by Leopold Reinecke in 1918–19 (*see* Geological Survey of Canada, Memoir No. 118), also by V. L. Eardley-Wilmot in 1923 and 1926 (*see* bulletin entitled "Investigation of Mineral Resources and the Mining Industry, 1923," published by Mines Branch, Department of Mines, Ottawa). It is quite unnecessary to repeat the detailed information to be found in these reports. A brief examination was, however, made by the Resident Engineer of these deposits this year (1927) and the following brief summary may be of use:—

The three chief exposures lie on the west side of the Fraser river. These are:—

(1.) R. G. Elliot's deposit on Lot 906, distant about 4½ miles from Quesnel in a south-westerly direction, situated some distance back from the river and 770 feet above it. This exposure indicates a thickness of about 40 feet of diatomite. It is overlain by vesicular basalt. A road leads to within 1½ miles of the deposit.

(2.) At the Big bend of the Fraser river on Lots 8643 and T.L. 39493, at the top of the steep bank of the river upwards of 500 feet in height, detached masses of diatomite are exposed, showing a thickness of about 20 feet. This exposure is about 10 miles distant from Quesnel and a car can be driven to within 1½ miles of it.

(3.) On Lot 1122, only 2½ miles from Quesnel, at about 40 feet above and 300 feet from the river, are two exposures about 300 feet apart. One of these indicates a thickness of not less than about 10 feet. The beds strike N. 52° W. (mag.) and dip south-west at about 25°. The exposure is about 20 feet in length horizontally, indicating about the width mentioned, which may be much greater. This deposit is overlain by 1 foot of alluvial diatomite, which again is overlain by 3 feet of silt and gravel.

With a comparatively small outlay in the way of roads, diatomite from any of these deposits can be delivered by motor-truck to the Pacific Great Eastern Railway at Quesnel. The Fraser river is crossed by a ferry at present, but it is understood that construction of a bridge across the Fraser river at Quesnel is contemplated by the Department of Public Works in the near future.

There is every reason to suppose that in the vicinity of these exposures a large area is underlain by diatomite (which could readily be determined by drilling) and that a large tonnage is available.

*Canadian Diatomite, Limited.*—This company made some investigation of the deposit at the Big bend on Lot 8643, but carried out no actual mining operations.

*Fraser River Benches at Kersley and Alexandria.*

A brief examination was made of these, which were undergoing testing by the respective owners concerned. These benches are extensive and even a preliminary investigation by means of sinking pits and rocking definite yardages to determine justification for drilling must occupy a very considerable time. Only comparatively superficial values are to be expected from the nature of the deposits and it is probable that such would be irregular. It is rather premature to discuss any possible method of working, but the benches seem too high above the river to contemplate dredging, having regard to the probable barren underlying gravels. Skimming the surface would have to be resorted to, possibly by drag-line scraper or caterpillar shovel.

*Leases of H. Dickinson and K. Brink.*—These leases are fifteen in number, covering two benches by Kersley, distant 13 miles south of Quesnel. The lower extends back from its river-frontage of approximately 2 miles for a distance of about 2,000 feet. Its higher portions are about 60 feet above river-level and the average height above water would be considerably less. The upper bench is about 135 feet above water-level and is about 1,000 by 300 yards in size; it was evidently the scene of investigation by very early miners as evidenced by old surface pits and workings. The owners have done considerable amount of testing on the lower bench by panning and rocking, and some attempt was made to do some larger-scale testing by constructing a small screening plant, using a team of horses and scraper to deliver gravel to this. The owners state that encouraging gold values can be obtained from the surface down to a depth of from 5 to 15 feet.

The deposit consists of river-gravel and sand and there do not appear to be any material quantity of large boulders. Samples were taken from each bench from points indicated by the owners as being promising. One from the lower bench assayed: Gold, 38 cents a ton, or say 57 cents a cubic yard; and that from the upper bench assayed: Gold, 19 cents a ton, or say 28½ cents a yard. Assays for platinum showed no trace of this metal. These samples represent the fine sand only and not the gravel, so that the average of sand and gravel at the points taken would not be more than half this. Still, the values are encouraging and warrant further investigation, which might well take the form of sinking small pits and rocking definite amounts of gravel to determine justification for drilling systematically.

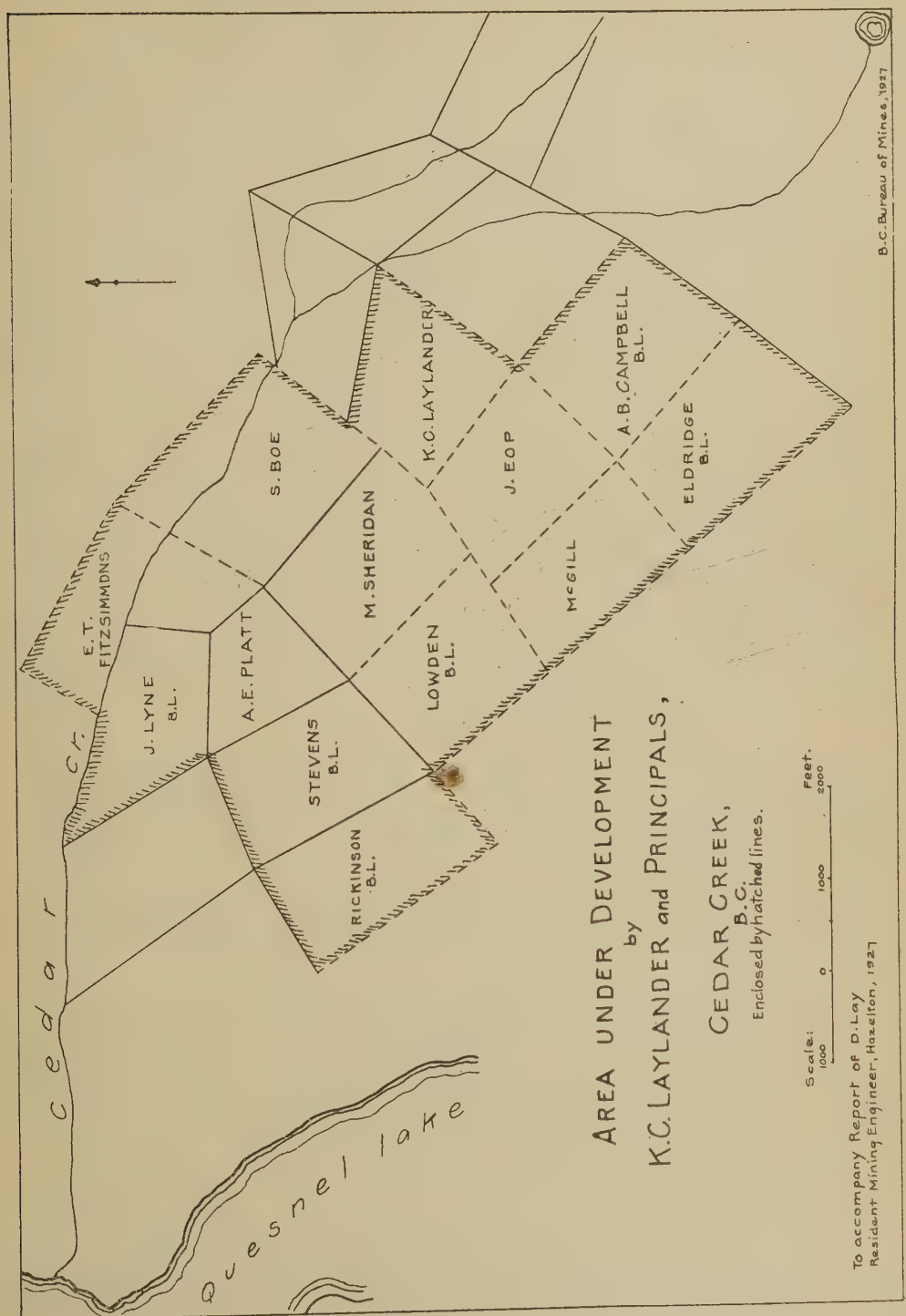
*Leases of R. G. McLeod.*—These leases, nine in number, cover an extensive bench somewhat similar to the lower bench described above, situated near Alexandria, 26 miles south of Quesnel on the east side of the river. This bench has a river-frontage of about 2 miles and extends up-stream from the Alexandria ferry. There are said to be in all five shafts sunk at different points on this bench from 4 to 46 feet in depth. A grab sample of sand only from one assayed: Gold, 6 cents a ton, or say 9 cents a cubic yard. It was stated that gravels from the other shafts averaged about 15 cents a yard. It is understood that the owner also has more ground on the west side of the river in this vicinity north of Marguerite.

It is interesting to note that the beach in front of and below the leases at Alexandria is systematically rocked each year by two Chinamen, who make good wages. There is a fresh harvest of gold each year. At the time of inspection evidence of this systematic rocking was apparent.

LIKELY SECTION.

*Cedar Creek.*

*Cedar Creek Mining Co., Ltd.*—From May until September the property of this company was operated under contract by B. Boe, who continued piping gravels with the pump-hydraulic system during this period. On September 15th an option on this property was acquired by K. C. Laylander, whose subsequent operations are described below.


Cedar Cr.
Quesnel Lake
E.T. FITZSIMMONS
J. LYNE B.L.
A.E. PLATT
S. BOE
M. SHERIDAN
STEVENS B.L.
RICKINSON B.L.
LOWDEN B.L.
K.C. LAYLANDER
J. EOP
McGILL
A.B. CAMPBELL B.L.
ELDRIDGE B.L.
B.C. Bureau of Mines, 1927
AREA UNDER DEVELOPMENT by K.C. LAYLANDER and PRINCIPALS, CEDAR CREEK, B.C.
Enclosed by hatched lines.
Scale: 1000 0 1000 2000 Feet.
To accompany Report of D. Lay Resident Mining Engineer, Hazelton, 1927

*Operations of K. C. Laylander.*—On September 15th K. C. Laylander acquired options on a number of leases on Cedar creek, including those held by the Cedar Creek Mining Company, and comprising an area roughly 2½ miles long by 1 mile wide. This option is now held by the Revenue Mining Company. The following leases are included in this consolidation (refer to map): *Lyne, Fitzsimmons, Stevens, Sheridan, Boe, Lowden* (formerly *McMahon*), *Campbell, Laylander* (formerly *F. Bayley*), *McGill, Eldridge* (formerly *T. Bayley*), *Rickinson, Eop* (formerly *McCallum*).

The original optionees at once commenced an extensive drilling campaign and a comprehensive topographical survey; meanwhile pump-hydraulic operations were carried on. All old pit exposures were very thoroughly sampled. Cross-sections of the area (which includes, of course, the "Big Channel") were drilled, the bearing of cross-sectional lines being N. 63° E. (at right angles to the western boundary of the *Stevens* lease). Exact results of this drilling were not disclosed, but it was stated that up to the time of inspection on October 20th fifty-six holes had been drilled with a Union Construction Company's type D 31 drill and that an extensive yardage of commercial ground had been proved. Moreover, good values were obtained on bedrock in the "Big Channel," the depth of which was not great, about 30 feet or so, in the portion drilled up to that time. The object of the drilling was to determine the total yardage and values and whether such warranted the installation of a large-scale treatment plant. It was evident that the operators were seriously testing the property.

The following particulars of the pump-hydraulic system used at this property were given by the management: The monitor pump, consuming about 90 horse-power, delivers 300 cubic feet of water a minute at a nozzle-pressure of 30 lb., a 3-inch nozzle being used. This pipes off about 110 cubic yards in 24 hours. The pump used to elevate the tailings has a capacity of about 250 cubic feet a minute, against a head of about 30 lb. pressure. Power is furnished by two steam-boilers of combined capacity of 126-horse-power and one boiler of 30-horse-power rating. The fuel used is cordwood. At the time of inspection thirty-five men were employed, including the drill crew.

Further information will be found concerning this property, and Cedar creek generally, in the Annual Reports for 1921, 1922, 1923, 1924, 1925, and 1926, and also in Geological Survey Summary Report, Part A, 1922, by W. A. Johnston.

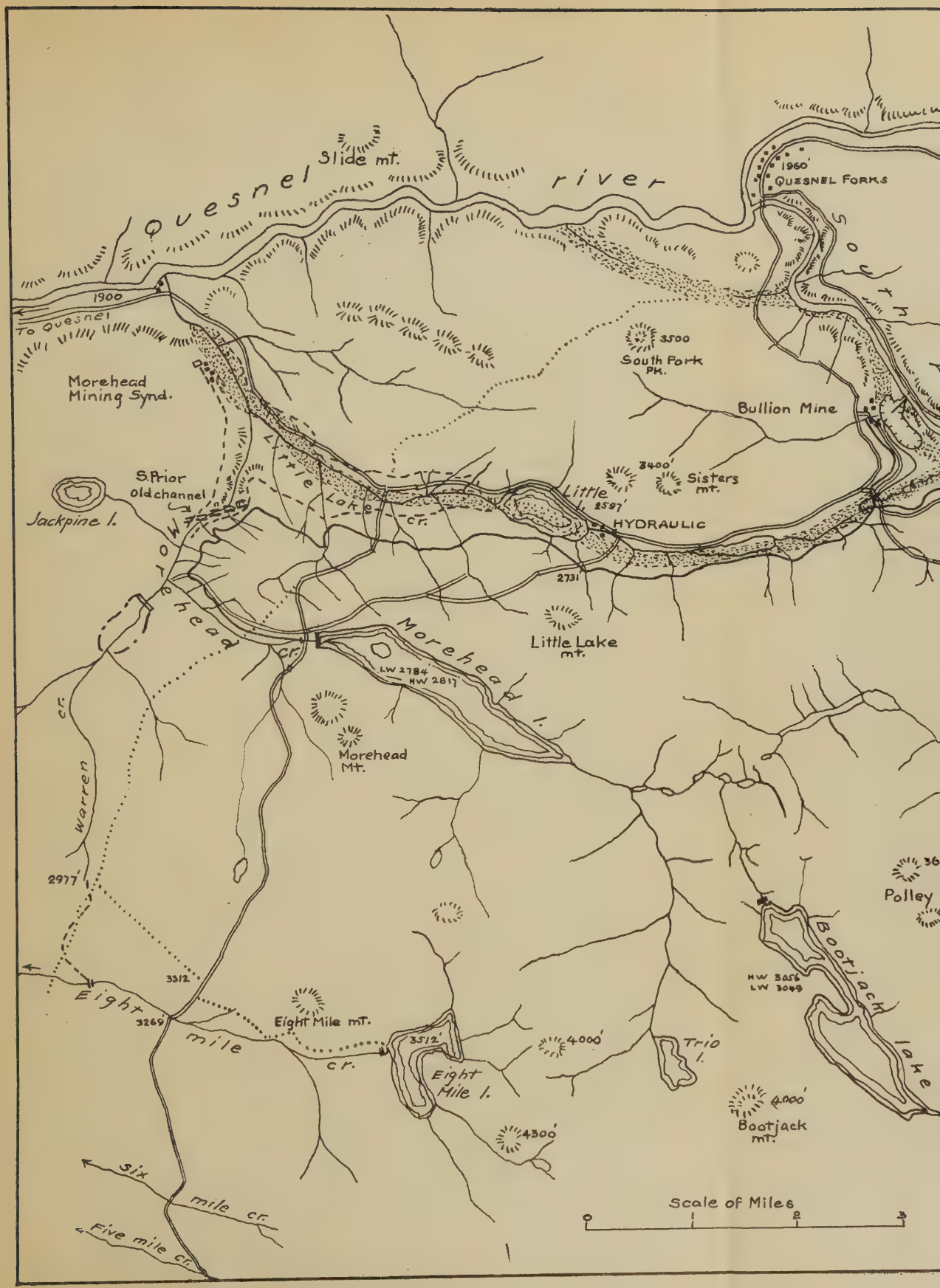
### *Quesnel Lake.*

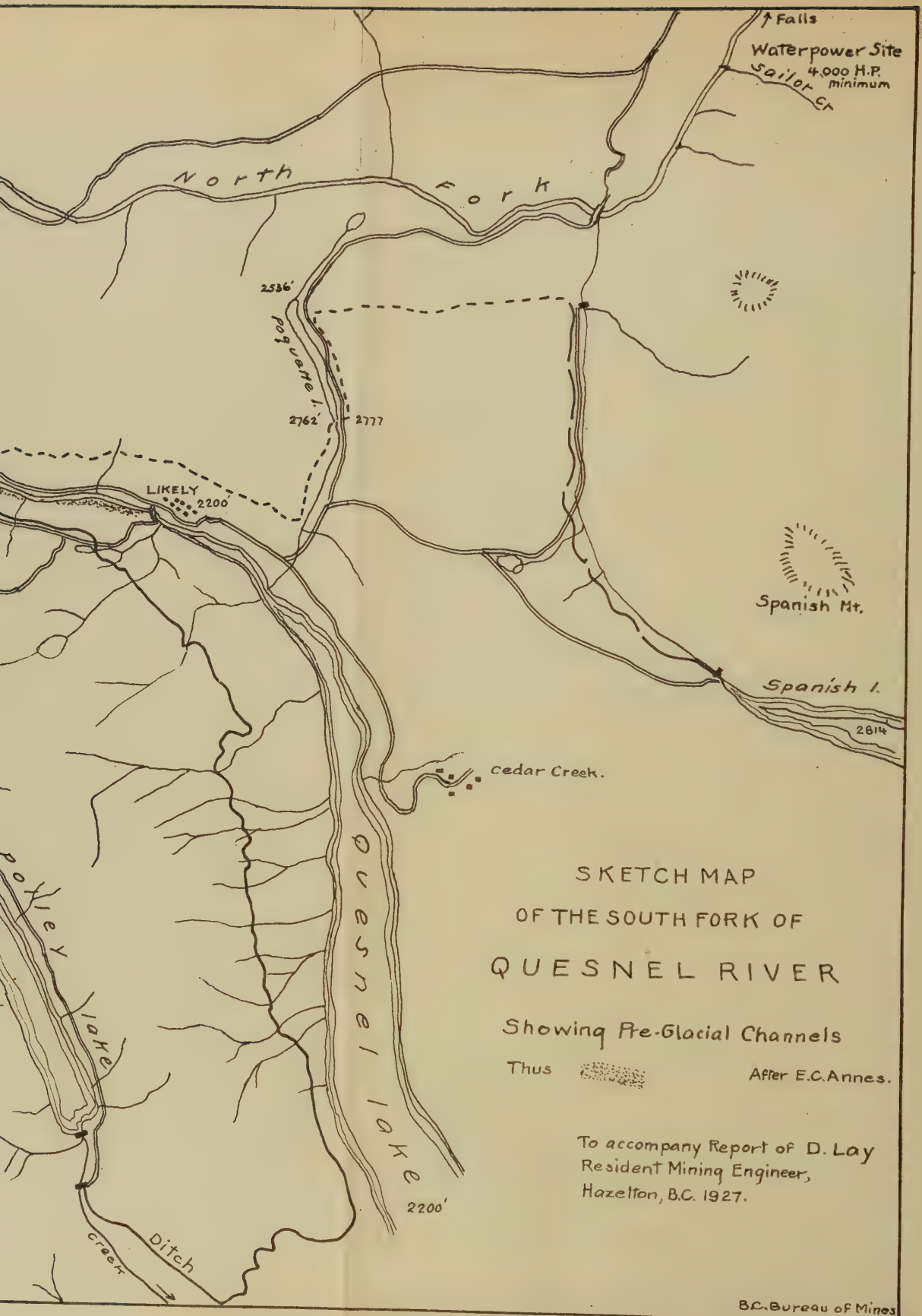
*Leases of C. Lackie.*—These leases are situated just above the lake, within 1½ miles of Likely. The main Likely–Keithley road passes through the upper portion of this property and the Likely–Cedar Creek road through the lower portion. A description will be found in the Annual Report for 1925, page 159.

Further work in a small way was done by the owner and his partner in washing the richer gravels exposed in the lower portion, but, inasmuch as the only water which it is within the means of the owners to use is that obtained by impounding the surface run-off, progress is naturally very slow.

This property well merits close investigation. The indications point to the likelihood that Poquette creek (which flows into the lake at the east end of the property) cuts through an older channel, which originally flowed westerly through the upper portion of this property, and then turned southerly through the central and lower portions of the property into the lake. Should this prove to be the case (and it is a very simple matter to prove by drilling), then there might be a channel 3,000 feet long by 300 feet wide at the top, and obviously in this event the yardage available would be very considerable. While this is largely conjecture at present, nevertheless it is a plausible hypothesis for investigation by drilling.

Assuming that drilling yields favourable results, the property can be readily hydraulicked. A limited but useful supply can be easily made available on Poquette creek. The flow of water in this creek on October 18th last was roughly estimated at 50 cubic feet a minute. A diversion or impounding dam at the entrance to Poquette pass by the wagon-road, with a flume from this point to the upper part of the leases and a penstock at the latter point, would give a head of 110 feet in the pit. A wagon-road passes along just below the flume-site mentioned, so that delivery of material for construction can be cheaply made.


Quesnel river
Slide mt.
1960'
QUESNEL FORKS
South
1900
To Quesnel
Morehead Mining Synd.
3500
South Fork Pk.
Bullion Mine
Little Lake cr.
3400'
Sisters mt.
Little
2597'
HYDRAULIC
S. Prior old channel
Jackpine I.
2731
Little Lake mt.
Morehead cr.
Morehead l.
LW 2784'
HW 2817
Morehead Mt.
Warren cr.
2977'
Polley
Bootjack lake
HW 3056
LW 3049
3312'
Eight mile cr.
3269
Eight Mile mt.
3512'
4000'
Trio l.
Eight Mile l.
4000'
Bootjack mt.
4300'
Six mile cr.
Five mile cr.
Scale of Miles
0
1
2
3


Falls
Waterpower Site
4,000 H.P. minimum
Sailor Cr.
North Fork
2536'
Poquette l.
2762'
2777
LIKELY
2200'
Spanish Mt.
Spanish l.
2814
Cedar Creek.
Quesnel lake
2200'
Creek
Ditch
SKETCH MAP
OF THE SOUTH FORK OF
QUESNEL RIVER
Showing Pre-Glacial Channels
Thus
After E.C. Annes.
To accompany Report of D. Lay
Resident Mining Engineer,
Hazelton, B.C. 1927.
B.C. Bureau of Mines

*Spanish Mountain.*

*Leases of J. W. Davis and S. Boe.*—Three leases owned by J. W. Davis and one owned by S. Boe are situated on the southern slopes of Spanish mountain, distant about 16 miles from Likely. By J. Lyne's cabin on the Likely–Spanish Lake road a trail leaves the road, following on an excellent grade the southern slope of Spanish mountain. The leases are about 8 miles distant from J. Lyne's cabin and are situated at an elevation of about 4,450 feet. At this point a flat trends S. 80° W. for a considerable distance. Work has centred on the investigation of this flat by means of a number of shafts, some to bed-rock, and one tunnel. A black schistose rock outcrops at one point, which appears to dip into the hill and which the owners think may form one rim of a channel. No noteworthy discovery of gold has been made, but the owners state that favourable indications were obtained in most of the workings and hope to be able to do some Keystone-drilling during the coming season. Justification for search for old channels at such high altitudes is afforded by the Cedar Creek occurrence, which lies across Cedar Creek valley to the south-west of these leases.

*North Fork of Quesnel River.*

In the Annual Report for 1926, under this heading was inserted a paragraph relative to river benches and terraces. It is amplified herein in the hope that it may be of benefit to any operators who may be concerned.

With regard to river benches and terraces in glaciated countries, it is considered that towards the close of the Glacial period the river-valleys were to a large extent filled with glacial debris resulting from the melting ice, which material as a rule contained only very low gold values. With the restoration of drainage the rivers cut down through these deposits and the outwash water exerted a sorting-action on the gravels on the valley-rims, causing in places a superficial concentration of gold. If at any particular point such water flowed on a surface impervious to gold, such as true bed-rock, or a false bed-rock such as slum or clay, if the supply of gold were forthcoming and other conditions favourable, there would be a certain concentration, although somewhat irregular, on the bed-rock.

An example of such concentration on a valley-rim of true bed-rock occurs at one point on the property of the Quesnel Gold Mining Company, below the Spanish Creek bridge over the North fork. An example of concentration on a false bed-rock slum is evidenced at W. F. Bendtsen's property lower down-stream on the same river. It is further to be remembered that even in such cases, although there is an enrichment on the bed-rock, the deposit as a whole is really superficial. More often than not, the conditions exemplified in the last two instances are not present, and the best values in a bench occur at the top and dwindle to nothing within a few feet.

A totally different set of conditions to the foregoing may be presented in certain quite exceptional cases; e.g., in the case of a tributary creek causing a local enrichment, or where a river has cut down through a much older pre-existing gold-bearing channel. In the latter case much of the gold content of the old channel will be reconcentrated a short distance down-stream from the point of intersection. Examples of such cases are Big Wheel flat on the South fork of the Quesnel river, where the old channel of the river was cut through by the modern river, and also the benches and bars in the immediate vicinity of Morehead (or 7-Mile) creek on the Quesnel river. These last-mentioned cases are the rare exceptions, however; and it is well to bear in mind that, as a general rule, river benches, terraces, and bars are therefore to be treated with circumspection. Adequate testing should be carried out before capital outlay is incurred in plant to treat such deposits by hydraulicking or otherwise.

**Matthias Gold Mining Co.**

Refer also to Annual Reports for the years 1925 and 1926. Operations during 1927 were carried on under the supervision of E. I. West and much piping was accomplished in a short time with an abundant water-supply. Two pits, about half a mile down-stream from the previous point of attack, were opened up at a point where a terraced surface showed superficial gold values. (*See* 1926 Annual Report.) The pits are about 200 yards apart. The down-stream pit shows two gravel terraces, one slightly above the other, each consisting of about 8 feet of sand, gravel, and silt, overlying up to 15 feet of slum and boulder-clay on bed-rock. Slum is 3 to 4 feet thick in places. Somewhat higher up the hill the gravels are cemented with lime leached from some near-by source. The total cover over bed-rock is about 20 to 25 feet. Boulders in boulder-clay are rather remarkable in that they contain exceptionally large crystals of iron pyrites. The up-stream pit

shows a bench of upwards of 20 feet of gravel, chicken-feed, and sand on top of a thick slum-bank, bed-rock not exposed. This deposit appears to be typical of superficial gold occurrence in river benches and terraces.

**Quesnel Gold Mining Co.**

Refer to Annual Reports for the years 1924, 1925, and 1926. This property was not under operation at the time visited in October, but it is understood that earlier in the year a considerable amount of tunnelling was done in the right bank of the river by the old *Victoria* pit. This consisted of 240 feet of tunnel, followed by 40 feet of upraise at the end, and another 60 feet of tunnel from the top of the raise.

*Leases of James Macdonald and T. W. S. Taylor.*—These leases are situated on the south or left bank of the river, about opposite the property of the Matthias Gold Mining Company. They cover three large benches, which occur tandem-fashion, one below the other. The top bench is about 170 feet above the river, the next 100 feet, and the lowest 50 feet above the river. At the extreme west end of the lowest bench bed-rock, a schistose volcanic rock, outcrops. Ground-sluicing at this point has disclosed a thickness of a few feet of apparently stream-gravels on bed-rock, overlain by slum, and evidence points to a shallow stream-channel possibly some 60 feet in width. While the present stream is very small, an old beaver-dam indicates that the stream quite recently was larger. Utilizing what water could be impounded by the beaver-dam, some ground-sluicing was done at this point which is stated to have indicated that the gravels average between 25 cents and $1 a cubic yard. The benches appear to have been formed by the river, as this was undoubtedly at this level at one time, and it is quite possible that the outwash water left the pre-existent stream-bed comparatively undisturbed. Evidence as to the latter is very meagre and some work at a higher point on its supposed course is required before much can be said about it. No material amount of work has been done on the large benches. A few pits sunk at different points would be advisable. Some of these benches yielded quite good superficial values and were the scene of activity in the early days. One such bench which was worked extensively, and was evidently productive, is the higher bench down-stream on W. F. Bendtsen's lease. This property is conveniently reached by a short trail from the main Likely–Keithley road.

*W. F. Bendtsen's Leases.*—These are situated about 2 miles down-stream from those of Macdonald & Taylor, on the same side of the river. A description will be found in the Annual Report for 1925. The owner is now utilizing water from Murderer's gulch for ground-sluicing and has also a small hydraulic plant which he uses wherever the flat topography permits. This water is conveyed by ditch along an upper bench which, as previously mentioned, was the scene of very early activity.

*J. Shaw's Lease.*—This lease is situated on the south side of the river, distant half a mile by road up-stream from Quesnel Forks. Unfortunately only seepage-water from the mountain-side flanking the river is available for ground-sluicing. By impounding this the owner managed to open up a cut at right angles to the river, about 400 feet in length, through a portion of the bench lying about 50 feet above the river. This cut exposes bed-rock for its entire length. The depth to bed-rock at the upper end of the cut is about 25 feet. Of this, the top 15 feet consists of river-gravel and sand and overlies about 8 feet of red pay-gravel, which again overlies about 3 feet of glacial debris and slum on bed-rock. Very coarse gold is obtained from the red gravel.

*W. J. Hill's Lease.*—This is situated about 1,500 feet up-stream on the same bench. Surface pits show 3 feet from the surface a pay-streak varying in width from ½ to 6 inches under a stratum of coarse boulders and overlying boulder-clay. This small pay-streak also yields very coarse gold, occasional nuggets up to an ounce in weight. Working of this lease is greatly hampered also by reason of no near-by water which lies within the means of the owners to render available.

Conditions on both these leases are unusual; they are not very clear in either case and less so on W. J. Hill's lease than on J. Shaw's. One thing seems fairly obvious, the source of such coarse gold as that described cannot be river-gravel. On Shaw's lease there is fairly clearly indicated a river-bench overlying a pre-existing interglacial run; that is to say, the presumed source of the gold is *lateral* and the run should be followed in towards the mountain-side, which flanks the river at this point. The same explanation probably holds good in the case of W. J. Hill's lease. There is unfortunately no good water-supply very close. Kangaroo creek, which flows into the river on the north side, could be brought across the river by pipe, although the expense involved would be considerable. Choice lies between that and pumping water from the

Quesnel—Deposit of Diatomite in Foreground.

Pleasant Valley, Cariboo—Drilling Placer-ground.

Peace River—Washing Gold Gravels.

Ferguson Mine, Finlay River.

river for any hydraulicking which investigation by drilling might justify. Apart from water, conditions on J. Shaw's ground are good for hydraulicking, as bed-rock appears to slope upwards at a good grade in the right direction. There may, however, be a fair number of good-sized boulders, although no great difficulties are presented in this respect. No bed-rock outcrops on W. J. Hill's lease and it is impossible to say how far down it lies. These two leases merit careful investigation with a view to drilling.

Among other small-scale operators on this river may be mentioned W. Westenhiser and A. Pearson, who own a lease immediately adjoining the property of the Matthias Gold Mining Company on the down-stream side.

*South Fork of Quesnel River.*

**Bullion.** The lease and bond holders, Ross, Holland & Ulsh, accomplished a great deal during the year. Improvements were made to the water system, comprising deepening the upper end of Jawbone creek to tap Morehead lake direct, and so eliminate a long length of flume and ditch, also deepening the upper end of North Fork creek, so causing water from Bootjack lake to flow into Morehead lake. The sluice-flume in the pit was repaired, the pit cleaned out, and about 300 feet in length of bed-rock gravels were piped off, or a total of about 6,000 cubic yards. Gravels were stated to average about 30 cents a cubic yard. The operators are entitled to much credit for essaying a heavy task and carrying it to a successful issue.

Among small-scale operators may be mentioned R. O. Nelson, who worked with his partner on the Nelson-Furler lease. For description of this *see* Annual Report for 1926.

*Morehead Creek (called also 7-Mile Creek).*—Morehead creek flows from Morehead lake north-easterly into the Quesnel river at a point approximately 7 miles below Quesnel Forks, hence the local and general name of "7-Mile." At about 1¾ miles above its mouth it receives a tributary, Little Lake creek, which flows from Little lake.

It has long been recognized as a reasonable certainty that in pre-glacial times the South fork of the Quesnel river, from a point somewhat up-stream from the *Bullion* pit, flowed approximately through the valley now occupied by Long lake, Little lake, and Morehead creek. Careful examination of such surface exposures and superficial features as are available serves to strengthen such a view. It also seems likely that there are other buried branches of such main channel, of which the *Bullion* channel is one, and there is evidence of two others—one, besides the main channel, on the property of the Morehead Mining Syndicate, exposed in the lower portion of Morehead creek, and one on the property of S. Prior, exposed in the upper portion of Morehead creek.

Of the two obvious points of attack on this great channel—that is, the ends—effort has hitherto been confined almost entirely to the east end, the *Bullion* mine. The west end is practically virgin, and indications there point to the existence of hydraulic possibilities of some magnitude.

**Morehead Mining Syndicate.** The members of this syndicate are E. C. Annes, F. Jacobie, and associates. The property consists of ten leases extending from the mouth of Morehead creek upwards. It is reached from Hydraulic, on the main Williams Lake–Likely road, by a branch road 6 miles in length. The property was operated in 1913, 1914, and 1915, but since that time has not been worked. This year E. C. Annes made a complete topographic survey of the holdings and with a small force carried out a considerable amount of sampling and testing of the gravels.

The upper portion of Morehead creek occupies a narrow gorge with steep rocky sides, which becomes canyon-like in places. Towards the junction of Little Lake creek the valley widens somewhat, although keeping its average depth of some 250 feet, until near the mouth, where the rims grade more or less gradually down to the Quesnel river.

About 2½ miles below Morehead lake the creek cuts through one old channel, at a small angle, on the property of S. Prior. About a mile farther down-stream on the property of the Morehead Mining Syndicate, just above the junction of Little Lake creek, the creek cuts through almost at right angles what is supposed to be the main South Fork-Morehead ancient channel. At the junction of the creeks the main creek swings somewhat sharply to the left and follows down along the right rim of the ancient channel for some considerable distance, finally cutting into the rim and then swinging away somewhat to the east. At the point where the rim was

cut into, on the opposite bank of Morehead creek, there is exposed a section of apparently another branch of this ancient channel. Just opposite this point a pit was opened up originally in the main channel and this is exposed in longitudinal elevation. Some 300 feet up-stream another pit was opened up, affording a cross-sectional view of the ancient channel, the bed-rock of which lies about 60 feet above that of Morehead creek. Exposures show a width of channel of about 500 feet and a depth of about 200 feet. Rim-rock at this point is a shale; at higher points it is volcanic breccia. An interesting feature of this pit is an intrusion of an ultra-basic rock, possibly the source of the platinum content of these gravels.

E. C. Annes, a member of the syndicate, supplies the following information as to values in the gravels, the result, he states, of careful sampling. The upper half of the gravels will average about 4 cents a cubic yard; these are the post-glacial gravels. The lower half of the gravels will average 40 cents a cubic yard, while bed-rock gravels will run as high as $10 a cubic yard. An average content of 22 cents a cubic yard is taken as a fair estimate of the average of the entire channel-gravels.

Wherever the modern creek eroded the ancient channel there would naturally result on the down-stream side of the point of intersection a reconcentration of the gold contents of the ancient channel in the modern channel, and such appears to be the undoubted origin of the placer-workings on Morehead creek which were the scene of activity in the very early days. Such also seems to be the origin of the gold content of the banks and bars of the Quesnel river in the vicinity of the mouth of this creek, where the modern river cuts through its ancient channel.

Besides gold values, it is stated that metals of the platinum group are present in the gravels. Much investigation along these lines has been carried out by E. C. Annes. As a result of this he states that black sands are present in the gravels to the extent of 2 lb. to the cubic yard of gravels. Of this quantity of black sands, it is stated that the one-hundredth part has been found to contain 1 per cent. of metals of the platinum group.

As to water supply: The supply of water used in the years of operation, 1913, 1914, and 1915, was derived partly from *Bullion* supply and partly from Morehead creek. The latter supply is quite inadequate and incommensurate with the size of the deposit. The members of the syndicate estimate that a supply of 1,500 cubic feet a minute could be rendered available from Long, Little, and 8-Mile lakes, and would be available for six months of the year at a cost in the neighbourhood of $75,000. The head would be about 400 feet. Such a supply of water should give a daily piping average of at least 2,000 cubic yards of gravel. It is evident, however, that should present ideas as to yardage and values be confirmed by drilling and other investigation which is called for, the question of rendering operations independent of climatic and seasonal conditions by pumping water from Quesnel river should be carefully studied, as well as the supply previously mentioned. Such would involve the development of hydro-electric power at the most suitable available site and the installation of electrically driven turbine-pumps on the Quesnel river. While the first cost would be much greater, it might be more than justified by the certainty of being able to operate for possibly seven or eight months each year.

Inasmuch as the water rights owned by the *Bullion* mine would afford for this property also an adequate supply, it would seem a happy issue if both properties were vested in a common ownership. In any case, however, there is every reason to suppose that the property of the Morehead Mining Syndicate is well able to stand upon its own merits.

As to early operations, the following particulars are supplied by the syndicate:—

| Year. | Days operated. | Cubic Yards piped. | Gold recovered. |
|---|---|---|---|
| 1913 | 78½ | 82,079 | $11,180.23 |
| 1914 and 1915 | 52 | 48,500 | 5,883.77 |

In 1913 a flow of 2,500 cubic feet of water a minute was available under a head of 110 feet. A 9-inch monitor-nozzle was used.

From the dimensions given of the supposed main ancient channel it must be evident that the yardage of this channel alone is vast, of the order of 5,000 cubic yards to the foot of channel, and perhaps considerably more. To what distance it can be hydraulicked along its length

depends upon the grade of the bed-rock, which is a matter for preliminary investigation. This large gravel-deposit of course requires extensive Keystone-drilling to determine the actual gold values.

As a property possessing all the indications of magnitude and meriting close investigation it is commended to the attention of those interested.

*Property of S. Prior.*—This property consists of three record claims. About 2½ miles below Morehead lake, or 1 mile above the junction of Little Lake creek and Morehead creek, the latter cuts through obliquely what is apparently an old channel exposed on both sides of the creek and trending about N. 60° E. (true). The direction of flow in this old channel cannot be determined from data available. The bottom lies somewhat below that of Morehead creek. It is possibly another branch of the ancient South Fork-Morehead channel. In the eighties a man named R. Davis attempted to sink to bed-rock on the east side of the creek in the old channel, but failed owing to water. More recently S. Prior piped out some of the gravels showing in the east bank of Morehead creek. There is evidence that this old channel is gold-bearing, inasmuch as there are many surface diggings at the point of its intersection by Morehead creek, the scene of activity in the early days. This channel certainly warrants investigation and drilling. In the absence of data afforded by the latter much must remain merely an interesting conjecture. As to the method of exploitation, that must depend upon many factors as yet unknown. Should bed-rock values prove sufficiently high, it would probably be possible to run a tunnel of not inordinate length from Morehead creek to tap that portion of it continuing eastwards. Such would probably leave the major portion of the gold contents unattacked. It is impossible to say what could be done in the way of hydraulicking until more data are available. Then, again, all important water rights in the vicinity are staked, and possibly any operation of this property would best be attempted by operators of the Morehead Mining Syndicate's property.

## Keithley Section.

This section was not visited during the year owing to great pressure of work in other sections.

**Kitchener.** K. C. Laylander supplies the following information concerning this property: During the earlier part of the season it was operated by parties on a "lay" from K. C. Laylander for a period of two and a half months. There was, however, no "clean-up." In the course of these operations an upper channel was developed. Work will probably be resumed next season by K. C. Laylander. For descriptions of this property refer to Annual Reports for the years 1921, 1922, 1923, 1924, 1925, and 1926.

## Horsefly Section.

Gold occurrence, the origin of which has been the subject of much discussion; unusual physiographic features; an occurrence of oil-shale on the banks of a placer creek; an extensive deposit of residual gravel; a deposit of marl; good near-by water-power sites; and apparent great age of the gold-bearing gravels are features which are all exhibited within a comparatively small area and which combine to make this section one of very great interest.

Attention is particularly directed to the reports on this section which appear in the Annual Reports for the years 1902, 1918, and 1920.

In the course of a necessarily brief inspection of this section this year one or two facts came to light which appear to lead to conclusions likely to aid in solving the problem of the location of the ancient channel, whence originated the gold of "Ward's Horsefly" and of "Hobson's Horsefly." It is not suggested that the conclusions herein expressed are other than provisional in view of limited field observation, but, inasmuch as they appear to rest on some substratum of fact, they may, considered in conjunction with other known facts, form a reasonable basis for investigation.

The predominant physiographic feature of this section is the Beaver valley, a master-valley which extends from Horsefly to Beavermouth on the Quesnel river, a distance of upwards of 50 miles. Further, it will be noted that from Beavermouth down-stream to nearly Quesnel the Quesnel river occupies practically the straight continuation of this valley. The occurrence of the upper end of such an extensive valley in immediate proximity to a modern drainage system inclines the view that the ancient drainage system was by way of such valley; a view greatly strengthened by the fact that the modern drainage system, after preserving for a very consider-

able distance a course more nearly coincident with the direction of that valley, makes an abrupt right-angled turn at practically the entrance to the valley. The tracing of this ancient drainage system is of great importance, because it seems entirely reasonable to assume that buried therein lies the channel from which originated, as the result of stream-piracy, the gold of "Ward's Horsefly" and "Hobson's Horsefly." If that proves to be the case it would not necessarily follow that the ancient channel was rich, because of the reconcentration which might be effected by stream-piracy. At the same time it might be rich because it is perhaps possible that it was not dissected to bed-rock. A remarkable fact is that an extensive deposit of residual gravel consisting almost entirely of well-rounded quartz pebbles, as in the case of the "Miocene" gravel, occurs some 3 miles south of Horsefly in the vicinity of Triplet and Star lakes. It was traced some distance south-east of Star lake and is said to extend as far north-west as Gravel creek. This residual gravel, at any rate, forms the banks of Moffat creek at a point some 3 miles south of Horsefly. It is said that at one point in this region on the west side of the creek the gravel is overlain by volcanic rocks. A special effort was made to inspect this spot, but unfortunately owing to recent slides it was quite inaccessible. However, J. R. Williams (who with Geo. Kuchan has leases on the residual gravel in the region of Triplet and Star lakes) was most positive on this point, and in view of the obvious great age of the gravel there seems no reason to doubt the fact. It is also of significance that Moffat creek, flowing north in this region, should be to-day running over this deposit. It will be noted that the direction of this deposit of residual gravel is practically identical with that of Beaver valley, which is north-west and south-east. Drilling of this gravel-deposit is contemplated by J. R. Williams and his partner and such will undoubtedly throw much light on the matter. It is likely that the bed-rock channel, if found, will be very deep and wide. Presumably this channel is the up-stream continuation of the "Miocene."

Referring to the 1902 and 1920 Annual Reports, it will be seen that the theories advanced hinge upon stream-piracy of a parent Beaver Valley ancient river; the suggestion advanced herein merely differs in that the facts point to a north-westerly and south-easterly course for such rather than an easterly and westerly. Further in the 1920 Annual Report it is suggested that drilling might well be done to the south of the area then drilled, which is the conclusion to be deduced from views herein given, except that drilling of the Triplet and Star Lake gravel should of course be done first as there is here a tangible and definite starting-point. The residual gravel of the supposed ancient stream is presumably of Tertiary age, and it seems quite possible that the north-flowing pirate-drainage was established in pre-glacial times.

Apart altogether from the particular question under discussion, it would seem that such a vast deposit of residual gravel as this ancient river-course contains must indicate a prodigious amount of quartz in the rocks at its headwaters. Prospecting at the headwaters of the Horsefly river and Moffat creek for such would seem worth while. Mention of quartz on the Crooked river is made on pages 68 and 69 of the 1902 Annual Report.

*Leases of J. R. Williams and Geo. Kuchan.*—These consist of five bench leases covering a portion of a deposit of residual gravel, well-worn quartz pebbles, which extends in a north-westerly and south-easterly direction in the region of Triplet and Star lakes, distant about 3 miles due south of Horsefly Post-office. The same deposit, or one of precisely the same character (it is stated that it can be traced on the surface between Triplet lake and Moffat creek), was inspected on the banks of Moffat creek, the latter apparently flowing over it at a point about north-west of Triplet lake. It is stated that in this region on Moffat creek, in the left bank of the latter, this residual gravel can be plainly seen to be overlain by volcanic rocks. Owing to a slide this point could not be verified. It is also stated that this residual gravel can be traced to Gravel creek. This point, owing to lack of time, could not be verified. The owners have sunk various pits in the vicinity of Star and Triplet lakes and have obtained, it is stated, promising indications of gold, but owing to water have been unable to continue sinking. They have accordingly decided to do some drilling. It seems likely that the depth to bed-rock in this region will be very considerable, also that recovery of bed-rock gold will involve sinking and drifting. The level of Star lake as determined by aneroid is 2,815 feet; that is, 215 feet above Horsefly Post-office.

*Moffat Creek.*

*Mikkelsen Leases.*—These are eleven in number, owned by C. (Sr.), J., P., C. (Jr.), A., A. T., T. T., and N. T. Mikkelsen, situated on Moffat creek and distant about 25 miles from Horsefly

Post-office. The property is reached from Horsefly by the old 108-Mile road, which is passable for cars as far as the Mikkelsen Ranch, a distance of 18 miles, at which point Moffat creek makes a right-angled turn and flows due north. A branch road, some 7 miles in length, from this point has been constructed by Messrs. Mikkelsen to the leases. The elevation of Horsefly Post-office as determined by aneroid is 2,600 feet; that of the Mikkelsen Ranch 3,300 feet. In this region Moffat creek flows through flat rolling country and its banks are fringed in places with meadow land. The fall per mile is approximately 50 feet and valley dissection very slight. The volume of water flowing is very considerable. A rough measurement on the leases in May indicated a flow of approximately 450 cubic feet a second.

Work done on the property has consisted of sinking one shaft a distance of 107 feet to apparent rim-rock on the north side of the creek; another to a depth of 17 feet about 1 mile down-stream on the south side; also numerous pits have been sunk in the banks at various places. Work has centred mainly on sinking the first-mentioned shaft, which is vertical. The elevation of the collar of this is 3,700 feet. It is sunk in the right bank at a point 6 feet above and only 20 feet from the creek—at a spot where perhaps nothing seemed more likely, judging from surface gravels, than that an inflow of water would stop further sinking immediately water-level was reached in the first few feet. In spite of that, no water whatever was encountered. In fact, when inspected in May there was less evidence of any water than might have been expected had it been sunk in solid rock. The shaft was of course tightly lagged and the gravel strata were not open to inspection, but the following are the depths of gravels as given by the owners, in descending order: 2 feet of sand; 12 feet of gravel with blue clay; 80-odd feet of gravel with no clay; 10 feet of sandy clay on a rim-rock sloping towards the creek; the total depth of the shaft being 107 feet. It is stated that the entire contents of the shaft were rocked and the gold recovered indicated an average of 11 cents a cubic yard, but it was getting coarse near rim-rock. Inspection of the gold stated to be recovered from the shaft showed such to be fine, but nuggety. Black sands were also present and it is stated that assays of this have shown platinum values. A sample of the black sands from the riffles of the sluice-box showed, however, no values in gold or platinum. The owners think that they may not have recovered half the gold present in the gravels of this shaft. That is possible. It seems unfortunate that the rim-rock was not followed downward. Subsequent to inspection, it is stated that some lagging was removed to permit of sampling the gravel, which resulted in this shaft caving, which is very unfortunate after achieving such a meritorious piece of work. It is most remarkable that there should be such an unusually impervious layer sealing off surface waters, but it is considered that the 12 feet of gravel with blue clay encountered in the shaft is probably the impervious stratum. It is stated that from the lower shaft a cubic yard was rocked which indicated values of 18 cents a cubic yard.

It seems that bed-rock is deep in this region, and if sufficiently high values are found on bed-rock to warrant such, sinking and drifting must be the method of mining adopted. The ground is too deep to dredge and from the description it must be apparent that no hydraulic possibilities are offered. Keystone-drilling would appear to be the cheapest expedient for the exploration of this ground.

*Antoine (Sucker) Creek.*

*Occurence of Oil-shale.*—Antoine creek is a small creek flowing from Antoine lake south-westerly into Beaver creek. The mouth of the creek is distant by motor-road (Beaver Valley road) about 12 miles from Horsefly. About a quarter of a mile above the mouth of the creek, in the left bank, is an exposure of oil-shale. In this region the creek has cut down to a depth of upwards of 100 feet. Rocks are exposed over a length of about 100 yards, but the strata are obscured in many places by vegetation and talus. The oil-shale is exposed on the south side of the creek only; it is underlain by conglomerate and overlain by a fine-grained red-coloured calcareous rock, either a calcareous sandstone or possibly a volcanic tuff, upwards of 50 feet in thickness; this again is overlain by black shales dipping almost vertically. The dip of oil-shale, calcareous sandstone, and conglomerate is less steep, and the dip of the beds flattens towards the head of the creek, suggesting a possible anticlinal structure. It is not possible to determine the thickness of the shales owing to vegetation and slide-rock. The shales are exposed at two points about 150 feet apart. The widest exposure is 5 feet. These beds strike north-east and dip at about 70° south-west. The strata on the north side of the creek are largely obscured by vegetation; conglomerate and black and red shales are exposed at different points. Just south-west

of these sedimentary strata high up on the north bank is an exposure of a thickly bedded porphyritic andesite lava, showing porphyritic crystals of pink feldspar. These beds appear to strike more nearly north and south with almost vertical dip. At about half a mile above the mouth of the creek the valley flattens and widens.

Upwards of a mile from the mouth there is an old drilling-rig standing in the open, with numerous tools and a large quantity of 5-inch casing. It is stated that some fifteen years ago one hole was drilled at this point to a considerable depth and another just at the mouth of the creek. No particulars of these holes are known. About 2 miles above the mouth of the creek, grading of a wagon-road has just exposed a black fossiliferous shale which is quite possibly in place. These fossils have been determined by F. H. McLearn, of the Geological Survey, as "Pseudomonotis? sp. Age: Triassic." It is quite impossible to determine the stratigraphic relationship between these rocks and the oil-shales, as there are no intervening rock-exposures.

Analyses of samples of the oil-shale gave the following results: Sample across 5 feet, 1.6 gallons a ton; sample of exposure 50 yards up-stream from above, 5.9 gallons a ton; picked sample, 7 gallons a ton. This oil-shale is not of commercial grade, and, moreover, the heavy overburden would be a serious detriment to economic mining.

The comparatively steep dip of the strata is a feature which does not hold out favourable possibilities as to oil being found in the underlying rocks in this region. Such scanty exposures as occur in the lower portion of the creek-valley indicate a flattening higher up the valley, as has been mentioned, but there are no rock-exposures within 2 miles at any rate, so that any confirmatory evidence on this point is lacking. It is of course possible that exposures of shale may be found somewhere in the vicinity which offer more possibilities, and it would seem worth while prospecting for such. In this connection it might be mentioned that some 12 miles north-west of this, Peavine ridge creek, which flows north-easterly into Beaver creek by Beaver lake, exposes sedimentary rocks (shales, sandstones, and conglomerates) in its valley for about a mile up from the main valley. These strike north-west and dip steeply south-west. At the present time the outlook for even fairly rich oil-shale is not particularly hopeful.

In connection with Antoine creek it is interesting to note that a certain amount of placer gold was taken from this creek in the early days. In placer gold and oil-shale it certainly presents points of diverse interest.

*Captain Charlie Creek.*

This creek flows into Beaver creek in a north-easterly direction about 2 miles east of Robert lake. R. N. and J. W. Campbell and N. Robertson have leases covering ground from the mouth of Captain Charlie creek south-eastward on benches of Beaver valley, on which they have been working during the year. They report encouraging values up to 40 cents a cubic yard in places and also state that the gravels show some platinum and native copper.

*Beaver Valley.*

*Deposit of Marl.*—At the northern edge of Beaver valley, somewhat east of Antoine creek, occurs a deposit of marl. Thickness and lateral extent are not exposed, but it appears to be of good quality. It is white or nearly so in colour, contains numerous small shells, and is obviously of high lime content, although exhibiting pronounced plasticity. It is used by neighbouring farmers for a variety of purposes.

*Williams Lake.*

It is interesting to record the activities of a lady prospector, Mrs. G. F. Havers, of Williams Lake, who carried out intelligent field-work during the year, the persistence of which seems likely to meet with success.

Jackie, Jeanette, Vera, and Violet.

These claims, owned by G. G. Groom and G. H. Turner, are situated on the mountain north of the Pacific Great Eastern Railway behind Williams Lake. Certain minerals in the volcanic rocks were reported as possessing radioactive properties. The minerals indicated in the field appeared from superficial examination to be epidote, hæmatite, and limonite. However, samples of rocks at the points indicated as most promising were submitted to the Geological Survey of Canada for determination of radioactivity. W. H. Collins, Director of the Geological Survey, reports as follows: "The three rock samples recently submitted to Dr. Poitevin to be examined for radioactivity were studied by Dr. Ellsworth in a United States Bureau of Mines type alpha-ray electroscope. Dr. Ellsworth's examination showed that there was no appreciable radioactivity in the specimens."

# CENTRAL MINERAL SURVEY DISTRICT (No. 3).

By H. G. Nichols, Resident Mining Engineer.

## INTRODUCTORY.

The Central District includes the seven Mining Divisions of Kamloops, Clinton, Lillooet, Ashcroft, Yale, Nicola, Vernon, and covers an area of approximately 44,000 square miles. The entire area, with the exception of the Vernon Division, is drained by the Fraser river and its tributaries and access to every part of the district is afforded by the valleys of these waterways.

The whole district offers opportunities for prospecting, mineralization of diverse character being distributed throughout.

Gold, silver, copper, arsenic, antimony, molybdenum, chromium, nickel, mercury, and tungsten are found in the western section, while silver-lead-zinc minerals are more characteristic of the eastern part.

In the areas overlain by recent volcanic flows a variety of non-metallic minerals occur, including gypsum, soda, epsomite, magnesite, hydromagnesite, and clays. Asbestos is found at several localities. Bituminous coal is mined in the Nicola Mining Division and extensive beds of lignite occur in the Clinton Division.

Not all the above products have yet been proved to occur in commercial quantities, but with few exceptions it may be said that the meagre amount of development that has been done in the district has afforded encouragement for further effort.

It is to be understood that a marked distinction is implied between development and prospecting; the prospector has not been without his disappointments, for the reason that, in most cases, the mineral-deposits of the district occur under conditions that require a greater amount of work for their exploitation than comes within the limit of individual enterprise. In illustration of the essential difference to be understood in this connection, a comparison may be made of the number of prospects and of the few instances of actual development-work on proven ore-bodies within the district. There are at the present time over 800 live prospects, excluding wildcat locations, and there are eight cases of mines that have been developed to any extent. Of these eight mines, the *Pioneer* in the Bridge River area is reported to have produced bullion to the total value of about one and a half million dollars and is expected, with the new equipment that has been provided, to reach a production for the year 1928 of a value of about a quarter of a million dollars; the adjoining *Coronation* had a production in 1927 of an estimated value of $30,500, and as a result of the application of profit to further development has been invested with a greatly improved outlook; the *Homestake* on Adams lake has produced ore of a gross value of approximately $130,000 and has recently been reported upon favourably by an independent engineer in high standing. At the *Lorne* on Bridge river, the *Donohoe* at Stump lake, and the *Iron Mask* at Kamloops the work done has been either partial development or may be said to have failed to exhaust the possibilities of ore occurrence. Properties such as the *Li-li-kel*, *Eva*, *Cotton Belt*, *Independence*, *Copper Bear*, and *Emancipation*, on which companies are doing extensive prospecting and development, are included in the list of prospects.

It is under the conditions outlined above that this district, with its undoubted promise of response to serious development, is to be considered as being dependent upon conditions of demand rather than as offering attraction by reason of past achievement, as is the case in other sections of the Province where mines of outstanding importance have already been developed.

It is satisfactory to note that demand has made itself felt and is reflected in the activities within the district during the past year. A feature of marked significance is in relation to the direct co-operation between mine operators and the prospectors and owners of prospects, that testifies to a spontaneity of interest, and has resulted in the commencement of active operations. Work of this nature indicating a growing interest in the ore reserves of the Interior is in progress in five out of the seven Mining Divisions of the district.

In the Clinton Division the Consolidated Mining and Smelting Company of Canada, Limited, has become interested in the mining properties of the Whitewater camp, Taseko river, and is making preparations for the commencement of critical prospecting-work.

In the Lillooet Division the Britannia Mining and Smelting Company, Limited, has taken an option on copper properties situated along the shore of Lillooet lake.

In the Yale Division the Consolidated Mining and Smelting Company of Canada, Limited, has been investigating the *Independence* copper-deposit near Coquihalla.

In the Kamloops Division Eastern capital has become interested in the extensive deposits of gold-bearing quartz near the headwaters of the North Thompson river, and in the Nicola Division Seattle interests are developing the *Leadville* near Merritt.

The importance of these investigations is emphasized when it is noted that factors of transportation and distance from railways are not allowed to interfere with the main objective of determining the extent of the ore-bodies in the first instance; in one case the mining camp being at a distance of 185 miles from the nearest point on a railway.

The construction of a good trail up Dewdney creek, in the Yale Mining Division, by which a direct route is provided from the Kettle Valley Railway to the summit of the divide between the Coquihalla and Tulameen rivers, will assist in the prospecting of this favourable area; and the completion of a motor-road up the North fork of Barriere river will greatly facilitate transportation to this camp.

## PROSPECTING.

The search for new ore-bodies has been confined largely to the known areas of mineralization, and there has been but little work in new areas of an exploratory character. Some interesting discoveries have been made, however, and among prospects that are here referred to for the first time may be mentioned silver-lead deposits on Adams plateau, occurring as replacement beds lying conformably with the formation; a body of silver-lead-zinc ore on the east side of Adams lake; a lead ore-body with associated silver values in a barite gangue on Iron mountain near Merritt; and cinnabar-deposits in the Bridge River valley.

The increasing demand for chromium in steel-manufacture, especially in connection with the automobile trade, has caused attention to be paid to the deposits of chromite in the peridotite and serpentine rocks of the Bonaparte valley.

It is gratifying to be able to record that the efforts of the prospectors to prove up values in the mineralized zones of the Whitewater camp in the Taseko valley have resulted in enlisting the interests of the Consolidated Mining and Smelting Company in this camp, and it is understood that prospecting development will be commenced by this company during 1928. A considerable expenditure has already been made on trail-construction.

Another camp that has suffered from the distance at which it lies from transportation is in the Clearwater Lakes area, where there are some imposing outcrops of gold-bearing quartz. The prospectors owning claims in this section have been carrying on surface work for several years under considerable difficulties. The area was investigated by a Geological Survey of Canada party during 1927 and work is to be continued during 1928.

Prospecting was active at the 23-Mile camp on the Hope–Princeton trail, and also some 10 miles farther down the Skagit river, where some new locations have been made at no great distance from the old Steamboat Mountain camp.

In general it may be said that there is need for prospecting over wider ranges of territory, and certain sections of country that are recommended are listed later on in this report under the heading "Summary."

In regard to the further prospecting of known occurrences, two points already referred to in the introductory remarks should be borne in mind. The first of these points is that in a large number of cases the character of the ore occurrence sets a limit to the extent to which the work of individual prospectors may be carried with profit; in many cases this limit has already been reached and a point has been arrived at where financial assistance is necessary for the carrying-out of further work to establish the value of the prospect. The second point is the interest manifested by operating companies in the discovery of worth-while prospects. It may, therefore, be fitting at the present time to make a suggestion for the purpose of encouraging the mutual relationship which is essential to the co-operation between mine operators and owners that is demanded by the situation. There are, of course, two points of view. On the one hand, the prospector, while realizing his inability to carry on the work of proving his property, quite naturally retains his own conception of its ultimate value; and, on the other hand, the mine operator is disinclined to pay a price based upon ultimate possibilities for a prospect that he himself has to prove.

It is under these conditions that the popular promotion practice has been evolved, whereby the prospector's point of view is catered to by the naming of a purchase price calculated to

support his natural optimism, while that of the operator is met by providing for payments over an extended term of years. It is by this means that many options have been arranged, with the net result that properties are tied up and no progress has been made.

If the industry is to be benefited and the interests of the prospector studied, the essential point to be aimed at is that work shall be done, and it is suggested to prospectors that provision for this should be made in any contract for the optioning of their properties. This can be done by the inclusion of a clause providing for the deposit of a sum of money as a guarantee of the performance of the necessary work, such sum to be drawn upon in payment for such work as it is done or forfeited to the owner of the property if it is not done within a stated time. No operating company with *bona-fide* intentions would take exception to such a clause.

*Placer-mining.*—Marked activity is evident on the Fraser and North Thompson rivers. Placer production for 1927 amounted to $3,910.

*Lode-mining.*—The following is the lode-mine production for 1927:—

| Mine. | Ore. | Gold. | Silver. | Copper. | Lead. | Zinc. |
|---|---|---|---|---|---|---|
| Kamloops Mining Division— | Tons. | Oz. | Oz. | Lb. | Lb. | Lb. |
| Homestake | 1,105 | 137 | 84,618 | ..... | 68,787 | 147,087 |
| Iron Mask | 14,471 | 189 | 452 | 268,368 | ..... | ..... |
| Vernon Mining Division— | | | | | | |
| St. Paul | 11 | 6 | 1,572 | ..... | 2,525 | 1,930 |
| Kelly | 1 | ..... | 33 | ..... | 49 | 46 |
| Lillooet Mining Division— | | | | | | |
| Pioneer | 9,961 | 4,508 | 784 | ..... | ..... | ..... |
| Coronation | 4,592 | 1,471 | 314 | ..... | ..... | ..... |
| Ashcroft Mining Division— | | | | | | |
| Independence | 1 | 1 | ..... | ..... | ..... | ..... |
| Totals | 30,142 | 6,312 | 87,773 | 268,368 | 71,361 | 149,063 |

## DEVELOPMENT.

The remarks under this heading include underground operations upon known ore-bodies.

Of first importance there are the developments on the *Pioneer* on Cadwallader creek. The anticipations expressed in the Annual Report for 1926 have been fulfilled and the year 1927 marked an important stage in the development of this property. Not only have the operations been successful from the point of view of mining development and production, but a step has been taken in the matter of the provision of new equipment, upon which it has been recognized that the successful operation of the property depended. The *Pioneer* is now one of the important producers of gold in the Province, and the successful results of development have been the cause of much interest being taken in the whole camp, where many opportunities occur for the opening-up of ore-bodies with gold and silver content.

In the Pemberton area developments in the Tenquille Creek camp have been confined to the operations of the Federal Mining and Smelting Company on the *Li-li-kel* and to the work of prospectors on silver-lead and copper prospects. This camp has not yet received the serious attention that it deserves.

On Lillooet lake extensive bodies of copper ore are being investigated by the Britannia Mining and Smelting Company, where some drifting-work is being done, and it is understood that diamond-drilling is to be commenced shortly.

In respect of the operations mentioned above, the Lillooet Mining Division takes first place in the matter of developments.

The outlook for the *Cotton Belt*, in the Kamloops Mining Division, continues to embrace possibilities of some magnitude, although the development-work conducted during 1927 cannot be said to have proved up ore on the scale that might have been anticipated from the surface exposures of the ore-body. There is without doubt a large reserve of low-grade lead-zinc ore to be developed in this camp.

Operations on the *Homestake* on Adams lake that have been in progress during the past two years have resulted in the production of ore valued at about $129,000.

Underground developments are also in progress upon a lead-zinc ore-body with some associated gold and silver values on the opposite side of Adams lake.

Underground development-work is being continued upon the *Iron Mask* near Kamloops, and it is understood that funds for further work have been provided by a reconstruction of the holding company.

In the Barriere section a crosscut tunnel is being driven to intercept a series of quartz veins with a silver-lead content on the *White Rock*.

In the Yale Mining Division the developments of principal interest are at the *Hillsbar*, where some serious work is being carried out upon a series of gold-bearing quartz veins that are exposed in the bed of the creek. The work being done is to enable the owners to prove up a reserve of ore before proceeding with the erection of a mill, a policy which is as commendable as it has been foreign to most of the undertakings of a similar character in this area. The same company is doing some development-work upon the old *Emigrant* on Siwash creek.

A small amount of underground work has been done on the *Emancipation*, but this is hardly in proportion to the requirements for its development.

In the Nicola Mining Division a shaft is being sunk on an interesting body of lead ore with associated silver values on Iron mountain near Merritt, and in the Vernon Mining Division some tunnelling-work has been carried out on a complex ore-body on Monashee mountain by the St. Paul Mining Company.

There has been a decided increase in the amount of underground development carried on in the district during the year.

In regard to non-metallics there is little progress to be reported, with the exception of the exploitation of a body of refractory clay in the Clinton Division from which some shipments have been made, and the continued operations of the B.C. Gypsum Company at the gypsum-deposit at Falkland.

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## SUMMARY.

The distribution of the mineral reserves of the district comprising ores of gold, silver, lead, zinc, and copper warrants a greater degree of areal exploration, while there are attractive opportunities for the investment of capital in the development of ore-bodies that are barely exposed at surface.

There are extensive deposits of non-metallic minerals that may form the basis of industrial activity.

Areas within the district that are recommended for exploration and prospecting are as follows:—

(1.) That lying between the Pacific Great Eastern Railway, south of Lillooet and the Fraser river down to Hope.

(2.) That extending from Okanagan lake on the west as far as Douglas lake and the Salmon river.

(3.) The eastern section of the Vernon Mining Division.

(4.) The country lying between Scotch creek and Adams lake, more especially in the neighbourhood of the belt of limestone that extends from about the forks of Scotch creek to a point north of Squaam bay.

(5.) The country lying to the west of the North Thompson river above Chu Chua.

## KAMLOOPS MINING DIVISION.

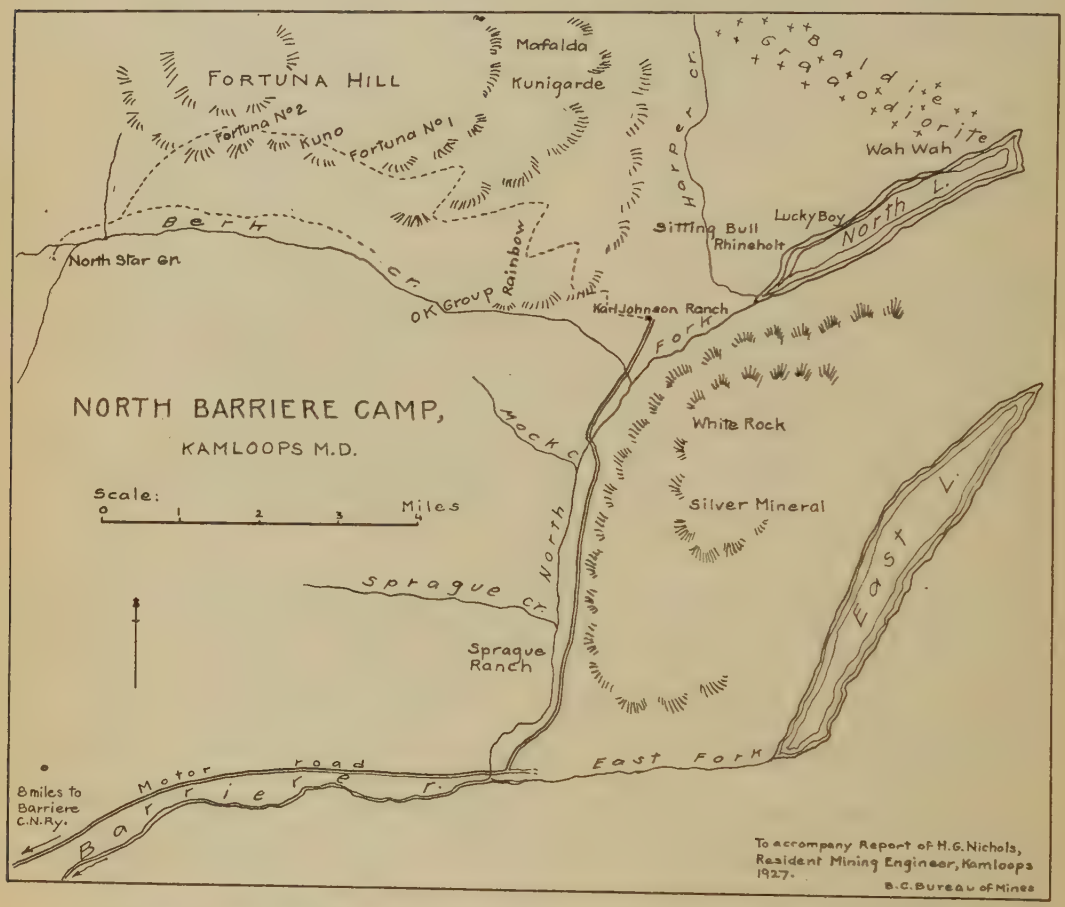
### BARRIERE SECTION.

#### *Barriere Camp.*

Upon general geological grounds this area has been recognized as offering considerable attractions to prospecting. It is unfortunate in being situated just beyond the limits of map areas that have been the subject of detailed investigations by the Geological Survey, while structural conditions exist that introduce some uncertainty in the correlation of formations;

in general terms, however, it may be stated that the prevailing schist formation is related to the mineralized series of the Adams Lake area and the occurrences of interbedded bands of limestone and dolomite afford favourable conditions for replacement deposits of the silver-lead-zinc type, more particularly as the field lies along the contact with the important mass of intrusive known as the Baldie granite.

The ground over which extensive prospecting has been carried on for several years past covers an area of approximately 60 square miles of the heavily timbered and hilly country lying to the south and west of North lake at the head of Barriere river. The two prominent hills are known locally as Bunker hill, lying to the south of North Barriere lake, and Fortuna hill, rising to an elevation of 6,000 feet on the north side of Birk creek, tributary on the west.




Until recently the area has been subject to some difficulties of access, but during the past two years substantial appropriations have been made by the Department of Mines towards the construction of a motor-road which now extends as far as K. Johnson's ranch just below the lake.

In the past, prospecting has been concentrated to a large extent upon a number of quartz veins and bodies in which silver-lead minerals have been found to occur irregularly. On Fortuna hill especially the surface exposures of these bodies of quartz are widely distributed and reach imposing dimensions, an outcrop on the *Kuno* claim having an apparent width of over 80 feet. Another feature of importance in connection with the mineralization of the area is the pyritic mineralization of certain flat-dipping beds of dolomite which are exposed along the bed of Berk creek and at several points on the hillside above. These beds have a thickness up to 30 feet in places, and the scale of this mineralization is suggestive of genetic relationship to the massive surface exposures of quartz. The theory advanced is that the beds in question have robbed

the ascending mineral solutions of their iron content, while the extensive bodies of quartz exposed at surface may represent the final stage of siliceous deposition. The fact of the scattered inclusions of silver-lead minerals in this quartz permits the assumption that silver-lead-zinc ore-bodies may be found as replacement beds at intermediate horizons or occurring in relation to structural conditions that have yet to be worked out. The view thus presented outlines possibilities of ore occurrence proportionate to the undoubtedly favourable geological conditions of the area, and warrants fully the efforts for their discovery that are being made and which the Department has materially assisted by the provision of adequate means of transportation.

**White Rock.** These claims, owned by the White Rock Mining Company, of Vancouver, are situated on Bunker hill, on the east side of Barriere river, at an elevation of between 1,500 and 2,400 feet above the river. Within a zone 500 feet wide that crosses the belt of limestone which has been described as the Tshinakin formation, of Cambrian age, there is a series of quartz veins and stringers having a strike slightly east of north and with a steep dip to the east. One of these veins is about 18 inches wide and carries heavy silver-lead mineral where it passes into the *Silver Mineral*, adjacent to the *White Rock* on the south. There are four other veins of a width greater than 12 inches, the remainder being in the nature of veinlets representing a general silicification in this zone crossing the limestone. A tunnel is being driven at a vertical depth of about 600 feet below the highest outcrop to intersect these veins at a distance of approximately 800 feet north of the point where an open-cut has been made on the *Silver Mineral*. It is estimated that this tunnel will have to be driven for a distance of about 450 feet, and as a means for determining the significance of this series of quartz veins it constitutes a useful piece of prospecting. The occurrence of high-grade silver-lead mineral in association with the belt of limestone is a favourable indication, but it might be desirable to do some more surface work with a view to determining the main trend of the mineralization before incurring too much expenditure upon underground work.

In this connection it may be mentioned that the contact of the limestone-belt with the schists of the Barriere formation lies at a distance of a few hundred feet to the south, and it is around this line that the principal exposures of silver-lead mineral have been found. Some specks of galena are found in the pinkish limestone and also as scattered inclusions in the quartz veins. A sample taken across 8 inches of a mineralized section of one vein assayed: Gold, trace; silver, 17.6 oz. to the ton; lead, 34 per cent.; and a sample of a small oxidized seam in the tunnel assayed: Gold, 0.10 oz. to the ton; silver, 21.5 oz. to the ton.

**Wahwah.** This property, owned by H. Bendelin, lies on the north side of North Barriere lake at an elevation of about 3,300 feet. There are two shear-zones heavily mineralized with pyrrhotite which lie 30 feet apart, having a strike slightly east of north and with a nearly vertical dip. These zones occur in a greenstone formation near the contact with the granite. Widths of solid mineral 2 feet wide and 8 feet wide are exposed in open-cuts on the two zones respectively, the upper cut being about 60 feet above the lower one. Samples across each of these cuts yielded traces in copper and zinc only, with no gold or silver values.

**Lucky Boy.** This claim, owned by J. Conway, is situated rather more than a mile to the south-west of the *Wahwah* and at a lower elevation. The tunnel has been driven for a distance of 150 feet through a zone of shearing and brecciation in cherty limestone and mica-schist, in which there is some slight impregnation with oxidized copper mineral. The tunnel was apparently driven to intercept a body of iron-stained siliceous material which is exposed on the surface, but no indications of value were found.

**Sitting Bull.** This property, owned by C. Kelly, is situated on the right bank of Harper creek, 1½ miles above Karl Johnson's ranch. A series of quartz-seams lying conformably with a badly shattered schist formation is exposed along the banks of the creek. The general direction is east and west, with a dip of 29° to the south. The creek-bed appears to represent a direction of faulting. A sample taken across 2 feet of one of the quartz-seams showing chalcopyrite assayed: Gold, trace; silver, 0.4 oz. to the ton; copper, 2 per cent. Certain seams in the schists are also mineralized with pyrite, but a sample revealed no more than traces in gold and silver. On the opposite side of the creek some large bodies of quartz are exposed on the *Rhineholt*.

**Rainbow and O.K.**

These groups cover the ground originally located in the names of the *Anaconda* and *Lynx* groups. They are situated on both sides of the valley of Birk creek at elevations of about 3,500 feet. Certain dolomitic beds in a chloritic-schist formation have been replaced on an extensive scale with pyrite carrying small quantities of lead, copper, and zinc. The whole formation is greatly altered and there are grounds for suspecting that certain beds may represent alterations of sills of igneous origin. The formation has a general strike north-west, south-east, with a very low dip to the north-east. A considerable amount of work has been done by Karl Johnson and associates in the driving of tunnels and open-cuts, but up to the present time no values of moment have been encountered. Thicknesses of these mineralized beds up to 30 feet and more are exposed in the several workings, in some cases, as in a tunnel on the *Rainbow*, solid mineral being exposed. A sample of one of these mineralized seams on the *Rainbow* assayed: Gold, trace; silver, 0.4 oz. to the ton.

The extensive mineralization on these properties is held to be one of the most striking features in connection with the camp, and the failure to find values so far should not be allowed to act as a deterrent to further prospecting.

**Kuno.**

This property, owned by Schilling Bros., of Chinook Cove, covers a large outcrop of white quartz on the south flank of Fortuna hill at an elevation of 5,400 feet. In a series of open-cuts a width of about 80 feet is indicated for this quartz ledge, but work both to the east and west has failed to establish continuity. At a distance of about 100 feet to the south and at a vertical distance below the big outcrop there is another apparently parallel body of quartz in which a fair-sized pocket of high grade silver-lead ore has been uncovered, and 70 feet below this exposure again, there is another outcrop of quartz carrying silver-lead mineral. A sample of the best ore in the intermediate showing assayed: Gold, trace; silver, 10.4 oz. to the ton; lead, 23 per cent.; and from the lowest showing a sample yielded: Gold, trace; silver, 8.4 oz. to the ton; lead, 23 per cent. No continuity has been proved for any of these bodies of quartz on the surface: they form striking outcrops and the lead and silver mineralization, where it does occur, is quite strong.

Other large bodies of quartz with scattered inclusions of galena occur on the *Fortuna No. 1*, *Fortuna No. 2*, *Kunigunde*, and *Mafalda*, all on Fortuna hill.

*Kunigunde.*—On this claim there are two open-cuts on a big ledge which appears to have a strike almost due north and south in a shattered talcky formation. Values as high as $60 in silver are reported to have been obtained at this point. This property is also owned by Schilling Bros., of Chinook Cove.

*Mafalda.*—This claim is owned by J. Pauli and is situated 1,500 feet to the north of the *Kunigunde*. A well-mineralized 20-inch vein with a north-and-south strike has been exposed.

**Fortuna No. 2.**

On this claim, owned by H. Bendelin, which is situated near the summit of Fortuna hill, a tunnel is being driven at a vertical depth of about 400 feet below the outcrop of some quartz-seams having a north-westerly strike. While this piece of work is perhaps unduly ambitious for an individual operator and is taking too long a chance in the prospecting for the downward continuation of the quartz-seams exposed at surface, it may in fact prove to be a valuable contribution in the way of throwing light upon structural conditions.

**North Star.**

The claims of this group are situated at the summit of the divide between the valley of Barriere creek and the North Thompson river above Chu Chua, and at the head of Birk creek, at a distance approximately 8 miles from Karl Johnson's ranch. The elevation lies between 5,400 and 6,000 feet. Work has been carried on at two places. Along the south bank of Birk creek there is a belt of ferruginous carbonate rock which is possibly a replacement of limestone, in which some lead-silver mineralization occurs irregularly distributed. A selected sample of this material assayed: Gold, trace: silver, 3 oz. to the ton; lead, 5 per cent. A graphitic schist occurs in contact with this belt of rock, the formation being almost vertical and having a strike slightly west of north. At a distance of about three-quarters of a mile south-east of this exposure a quartz vein, having a strike of N. 10° W. and a dip of 50° to the west, has been traced up the steep hillside from the bed of a small creek, tributary to Birk creek, for a distance of a few hundred feet. The formation at this point is composed of argillite, graphitic schist, and a fine-grained conglomerate and shows signs of considerable disturbance. A dyke-rock carrying pyrite cuts the formation in the vicinity of the vein. For the greater part this vein, which is approximately 18 inches

wide, is composed of a barren-looking white quartz, but seams and pockets of high-grade galena occur in it. A sample taken from one of these pockets of ore assayed: Gold, 0.4 oz. to the ton; silver, 34 oz. to the ton; lead, 51 per cent. A sample taken from the barren-looking quartz assayed: Gold, trace; silver, 0.6 oz. to the ton.

*Birch Island Area.*

**Red Top.** This group of five claims is owned by W. E. Noble and associates, of Birch Island. The property is situated on the north slope of Mount McClennan, at a distance of about 5 miles from Birch Island, at an elevation of about 4,000 feet. Silver-lead mineralization is found in a zone of shearing associated with a belt of limestone lying in a quartzite formation and is found to extend over a distance of over 2,000 feet in a series of open-cuts which expose widths of 12 feet and 18 feet of mineralized seams, having a dip of 45° to the north. The owner states that values up to $100 a ton have been obtained from selected samples.

**Birch Island.** This property, owned by T. Montgomery, is situated on Foghorn creek. Some promising seams of ore have been uncovered which appear to line up with the direction of the mineralization on the Smuggler hill. The property lies at a considerably lower elevation than the *Smuggler*.

**Smuggler.** The operations that were being carried on by a local company upon this property were suspended in the early part of 1927. A considerable amount of work in the nature of surface prospecting was done, including open-cuts and the driving of two tunnels. The upper tunnel-workings include about 210 feet of drifting that follows the undulations of an approximately horizontal seam of ore which has an average width of about 6 inches. The lower tunnel-work, some 200 feet below, is in continuation of a long open-cut and tunnel that had been started previously and abandoned; this tunnel has been driven into the hill for 90 feet, and a 20-foot raise, which does not quite come to surface, was put up from the face. In this tunnel a large body of almost barren quartz was cut in addition to some narrow flat-dipping seams of ore. In the course of the underground work about 25 tons of ore of a value of approximately $30 a ton was extracted from the upper tunnel-workings, with about 20 times its weight of waste rock. In the lower tunnel a feature of some encouragement is to be found in the scales of mineral associated with steeply dipping fractures that cut the schist formation; these fractures are not continuous.

The extent of the surface mineralization is a favourable feature in connection with the possibility of deeper-seated ore occurrence, but in so far as the surface exposures are concerned it would appear that, while further work might result in the discovery of other similar bodies of ore, no such repetition of the known surface conditions would provide a basis for economical mining operations. The following samples were taken:—From the upper tunnel across 14 inches, including a 6-inch seam of ore near the face: Gold, trace; silver, 2.4 oz. to the ton; lead, 7.4 per cent.; zinc, 1 per cent. From the upper tunnel 12 feet back from the face, across a width of 6 inches: Gold, 0.06 oz. to the ton; silver, 11.6 oz. to the ton; lead, 33 per cent.; zinc, 1 per cent.

A sample taken of the ore on the dump from the upper tunnel assayed: Gold, 0.04 oz. to the ton; silver, 11.5 oz. to the ton; lead, 30 per cent.; zinc, 1 per cent. A sample of ore on the dump from the lower tunnel derived from the narrow seams above mentioned assayed: Gold, 0.04 oz. to the ton; silver, 42.6 oz. to the ton; lead, 39.4 per cent.; zinc, 1 per cent.

Sampling of the mineralized schist, excluding the compact sulphide ore of the narrow seams, yielded negative results.

*Minnesota Girl.*—Assessment-work on this property was carried out by J. Schlichter, who reports a change of formation in the extension of his long crosscut tunnel with improved mineralization.

CHU CHUA SECTION.

*Windpass.*—No further work has been done on this property and the construction of a treatment plant for the recovery of values from the ore already blocked out has been postponed.

**Queen Bess.** An ill-advised attempt was made during the year to exploit this property on a basis of assured productive capacity. A large amount of capital was expended in the installation of machinery and equipment, which could only have been justified by proof of ore reserves. This is an interesting prospect, on which seams

up to 2 feet in width of a massive zinc ore occur in a zone of block faulting in the Fennell formation. The particular structural conditions render it necessary that a large amount of development, intelligently applied, should be done before any estimate of reserves is attempted. The operations were suspended in the month of September. The property is situated 3 miles below Blackpool, on the Canadian National Railway.

*Silver Lake.*—Some further open-cutting on this property near Mount Olie tends to improve the chances of finding continuity of the ore-deposition in the mineralized shear-zone.

*Gold Hill.*—A bond has been taken on this property on Dunn creek by R. L. Reid, of Louis Creek.

*Placer-mining.*—R. L. Reid is continuing preparations for the hydraulic working of the Louis Creek placer-ground, where a flume over a mile long is being constructed.

### *Clearwater Area.*

The area around the headwaters of the Azure river at the northern boundary of the district has claimed attention for several years past on account of the discovery of large bodies of auriferous quartz in the sedimentary rocks of the Shuswap series. During the past season a Geological Survey of Canada party under J. R. Marshall commenced a survey of the area, which is to be extended during the coming year. The development of an area such as this is bound to be slow; it is by proof alone of large tonnage and consistent values that economic value can be assured, and such proof can only be obtained with adequate equipment for operations. Herein lies the difficulty, for the construction of a trail to fulfil the requirements of transportation of such equipment would entail, in this case, an expenditure that might appear to be out of proportion to merely prospective value of the properties.

The camp is reached from Lempriere, on the Canadian National Railway, where the North Thompson river, coming down from the west, swings round, at its junction with the Albreda, into the north and south valley, which it follows down to Kamloops. There is a fairly good trail for 15 miles up the North Thompson valley to a point where the valley narrows almost to a canyon, with rock bluffs and slides bordering the river. From there on the remaining 30-odd miles of trail is a makeshift. A climb of 800 feet is made and a succession of ridges, mud-holes, and swamps are passed before again coming down to the river-level beyond a bend, at a distance of 26 miles from the railway. Seven miles higher up, in a north-westerly direction, the river is crossed at a ford (not always passable) and a climb from an elevation of about 3,160 to 5,400 feet is made in a distance of 4 miles, up Pass creek, due west to the summit of the divide between the Azure and North Thompson rivers. A descent of 1,000 feet is made down to the Azure river, a big, swiftly flowing stream. This is one of the worst sections of the trail, which then follows the east bank of the river up to the *War Colt* for a distance of about 3 miles.

A reconnaissance of an alternative route over the divide between the Azure river and the Raush, a tributary of the Fraser, and down the valley of the latter to connect with the Canadian National Railway at McBride was made during 1927 by A. P. Horne, accompanied by Adolph Anderson. It is reported that a trail could be constructed over this route which would be approximately 55 miles in length, and that with the exception of the upper sections, where a drop of 1,400 feet is made in the course of 2 miles and three canyons have to be passed, necessitating bridge-work, no very great difficulties would be encountered.

These notes in regard to the transportation difficulty are included with a view to stressing the conditions upon which the development of this camp depends. There are considerable attractions in connection with the size of the mineralized quartz-bodies, but the general structure upon which much depends is not clear and no intrusive rock is in evidence anywhere within the area.

**Summit.** This property is owned by A. P. Horne and associates, of Blue River. It is situated on the west side of Azure river, at a distance of about 4 miles from its source, and reaches up to a high plateau that forms the divide between waters tributary to the North Thompson river on the east and those flowing into Clearwater lake on the south, and Quesnel lake on the west, respectively.

The area is occupied by rocks of the Shuswap terrane series, and the predominating members in the immediate vicinity of the claims are more or less impure quartzites, schists, and pebble conglomerates, with interbedded bands of limestone. The planes of schistosity cut the bedding at a small angle, the general trend of the formation being north-west, south-east, with a high angle of dip.

Azure River—Looking North.

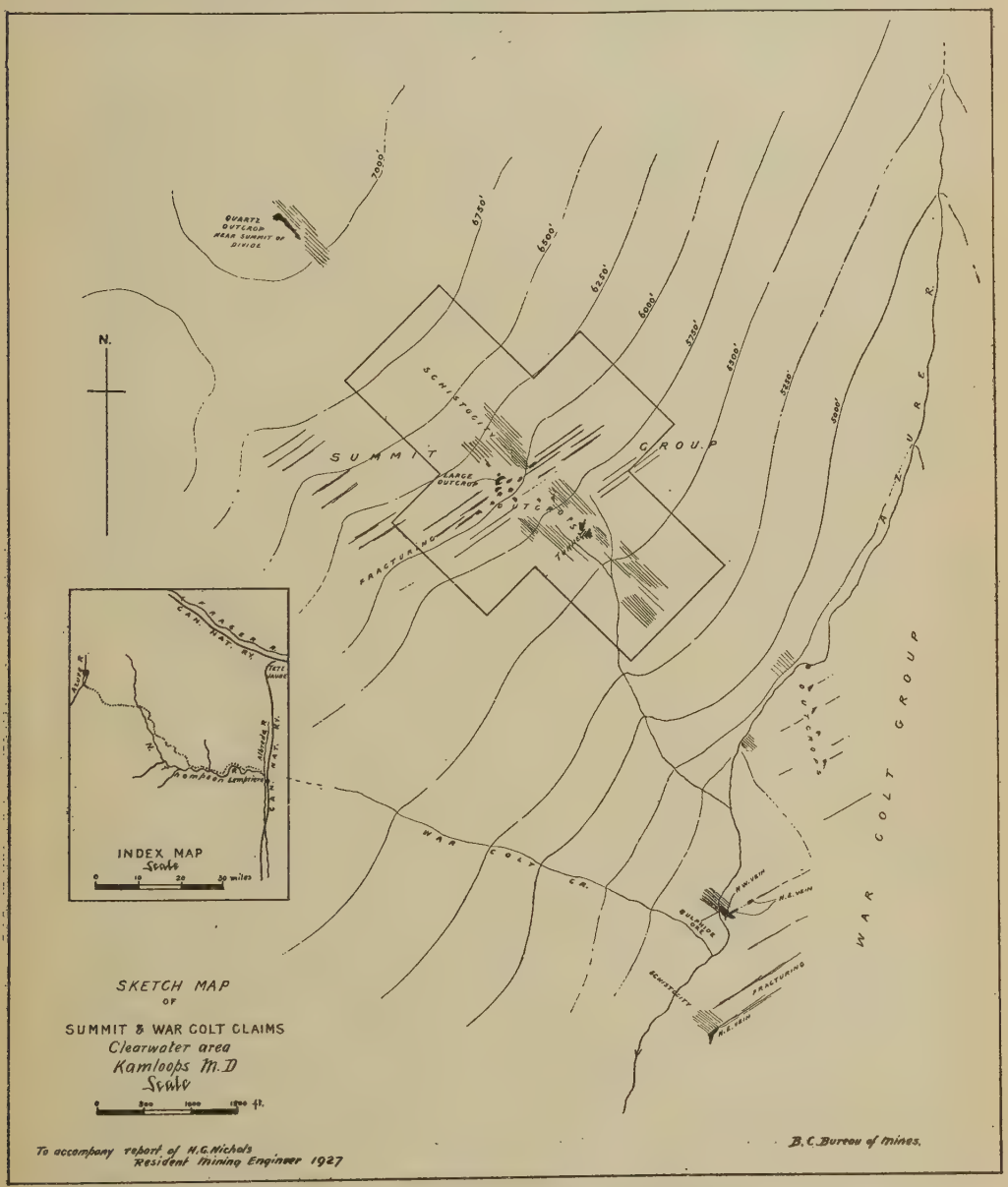
War Colt Mine, Kamloops M.D.

Taseko River—Looking North.

Mica-deposit near Vernon.

Extensive bodies of quartz occur, lying with the formation, and also developed along a system of cross-fracturing having a general north-east, south-west direction. There is a certain amount of pyrite associated with the quartz and gold and silver values have been found at certain points.

The greatest amount of work, with the exception of a crosscut tunnel, to be referred to later, has been done in the form of open-cuts and stripping in a section where a zone of pronounced fracturing intersects a series of quartz-exposures that conform to the general trend of




the formation. The highest values were obtained from spot samples taken from outcrops in this section, and this phase of the occurrence is responsible for the cruciform arrangement of the claims in the group.

Massive bodies of quartz, sparsely mineralized, also occur near the top of the divide, at a distance of approximately 3,500 feet from and in line with the principal outcrops on the claims,

in the direction of the formation. The amount of work that has been done, although highly creditable to the owners in view of the difficulties that had to be overcome, is insufficient for a definite description of the occurrence; the impression obtained is of a wide mineralized zone lying with the formation, characterized by massive surface exposures of quartz in which mineralization is influenced by cross-fracturing, while the near-by presence of bands of limestone and occasional inclusions of galena are suggestive of possibilities in connection with more base mineralization at some depth.

At a vertical distance of about 450 feet below the principal outcrops a crosscut tunnel has been driven for about 40 feet through a body of quartz 30 feet wide. Channel samples taken along the north-west side of the tunnel yielded a composite value of $4.06 in gold and silver over a width of 24 feet, or $6.50 in gold and silver over a width of 15 feet.

The property was examined during the year by J. W. Morrison, representing Eastern interests, and he also took samples from this tunnel that gave an average value of $2.90 for a width of 26 feet. One hand-sample of compact sulphide taken by Mr. Morrison assayed $45.60.

Around the principal outcrop there is an area of approximately 30,000 square feet, in which massive bodies of quartz occur, and outcrops in the direction of the cross-fracturing extend for a distance of 400 feet to the north-east.

A picked sample of quartz containing pyrite from the most north-easterly of these exposures assayed: Gold, 0.80 oz. to the ton; silver, 0.60 oz. to the ton.

A sample from an outcrop at a slightly higher elevation and 150 feet to the south of the above yielded: Gold, 0.80 oz. to the ton; silver, 4.20 oz. to the ton.

A sample of the clean quartz at the big outcrop assayed traces in gold and silver.

A sample across 14 inches of a north-east seam in this outcrop, showing pyrite, assayed: Gold, 0.34 oz. to the ton; silver, 1.20 oz. to the ton. And a sample taken across 4 feet of the massive outcrop above referred to, near the top of the divide, yielded traces in gold and silver.

**War Colt.**

The outcrops on this property, which is owned by Adolf Anderson and associates, lie on the east side of Azure river, south-east of the *Summit*. The most important workings are on the bank of the river, where a short tunnel has been driven from an open-cut and a shallow prospect-shaft put down in a body of sulphide ore just outside the portal. At this point there appears to be an intersection of a quartz vein that follows the direction of the north-east fracturing, with another body of quartz lying conformably with the north-west, south-east formation, in which the sulphide ore occurs in the form of a pocket.

A sample taken across a width of 5 feet on the north-east vein, which is almost vertical, in the face of the tunnel yielded no results. A sample taken across 5 feet 6 inches of the north-westerly quartz vein near the portal assayed: Gold, 0.10 oz. to the ton; silver, 5.40 oz. to the ton. And a sample of the sulphide ore from the prospect-shaft assayed: Gold, 0.04 oz. to the ton; silver, 13 oz. to the ton; copper, 7.8 per cent.; lead, 8 per cent.; zinc, 3.2 per cent.

The north-east vein outcrops at an elevation of about 200 feet above the tunnel and at a distance of about 250 feet from it, where it is 7 feet wide. A sample taken across the clear quartz at this point had no gold or silver content.

A second vein having a north-east strike and steep dip to the north-west outcrops on the steep side-hill at a distance of approximately 1,200 feet south of the tunnel and at an elevation of 800 feet above it. This vein clearly cuts the lime-schist formation and as exposed in some surface-stripping has a width of nearly 30 feet. A sample taken across 4 feet 6 inches on the hanging-wall side assayed: Gold, trace; silver, 1.40 oz. to the ton. A sample taken from points along 20 feet of the exposed sections towards the foot-wall assayed: Gold, *nil;* silver, *nil.*

A number of partly exposed bodies of quartz can be traced across the flats bordering the river in a general south-easterly direction for a distance of about 1,000 feet from a point in the river-bed immediately below the *Summit* workings. It is not certain whether these bodies of quartz are to be taken as indicating a vein following the direction named, or whether they are individually related to a succession of crossing fractures, and owe the apparent alignment of their exposures to topographical features.

In connection with the *War Colt* there are two points to be noted. It is a matter of possible significance that fairly massive sulphide ore has been found at the lowest horizon at which any work has been done in the camp; and, secondly, the results of sampling, cited above, do not encourage the idea that the well-defined quartz veins, related to the cross-fracturing system, are

to be considered as of economic importance; in relation to the latter point it is to be mentioned that the owner states that values ranging between $4 and $5 a ton have been obtained from samples taken from these veins.

### Seymour River Section.

**Cotton Belt.**

The development of this lead-zinc deposit in the Seymour River valley has been continued by Cotton Belt Mines, Limited, a local company, of which B. F. Lundy is president. In addition to the diamond-drilling that was referred to in the 1926 Annual Report, the company has carried out underground development, totalling 1,600 feet, in drifting, crosscutting, and raising; a large amount of surface-stripping and open-cut work has been done and substantial camp accommodation, comprising fifteen buildings in all, has been constructed. Work is being continued through the winter.

The greatest amount of work was done in the development of a section of the ore-body where surface exposures indicated widths up to about 12 feet over a distance of approximately 250 feet. The No. 2 tunnel, at an elevation of about 5,560 feet, has been driven for 800 feet and extends below the section of outcrop above referred to. The mineralized seam has been followed for practically the full distance, its average width being between 18 and 24 inches; while immediately below the big outcrop there is a section about 100 feet long where the ore was found to be from 3 to 4 feet wide and of a better grade. A raise was put up on this ore for a distance of 150 feet on the dip of the ore-body (35°) and the width was found to vary with undulations of the foot-wall, which is identified with a band of limestone; the maximum width of ore in the raise is 4 feet.

A grab sample of ore from the raise assayed: Gold, trace; silver, 1 oz. to the ton; lead, 4.4 per cent.; zinc, trace. Such a sample is apt to be misleading and it is only by systematic channel sampling of such an ore-body as this is that average values may be estimated. The whole length of the ore-body exposed in the No. 2 tunnel was sampled by the company's engineer in this way, and it is understood that the values obtained were fairly uniform within a range of from $12 to $15 to the ton.

No. 1 tunnel, 100 feet vertically above No. 2, has been driven in on the ore-body for 137 feet. The face of the tunnel is about 60 feet below the surface on the dip of the ore-body, and it is reported that the width of the ore is increasing at this point, a fact which would be in agreement with the outline of the ore-shoot as represented in the accompanying projection.

At a vertical depth of about 300 feet below the No. 2 tunnel, and at a distance of approximately 1,600 feet to the north-west, another strong outcrop was exposed during the past season, and No. 3 tunnel has been driven in under it for a distance of 153 feet; the ore in this tunnel is also reported to improve as depth is attained.

At a further distance of about 1,650 feet to the north-west and 560 feet below the No. 2 tunnel the Bass shaft is sunk to a depth of about 40 feet below a strong outcrop which has the appearance of being the most promising of all the surface exposures of the ore-body. This shaft, which was put down some years ago, had been abandoned at a point where it appeared that a steeper dip of the hanging-wall might result in a rapid narrowing of the ore-body, but recent work on the foot-wall side has shown that the dip of the foot-wall changes in like manner and the ore seems to continue in depth, of the same width as on the surface.

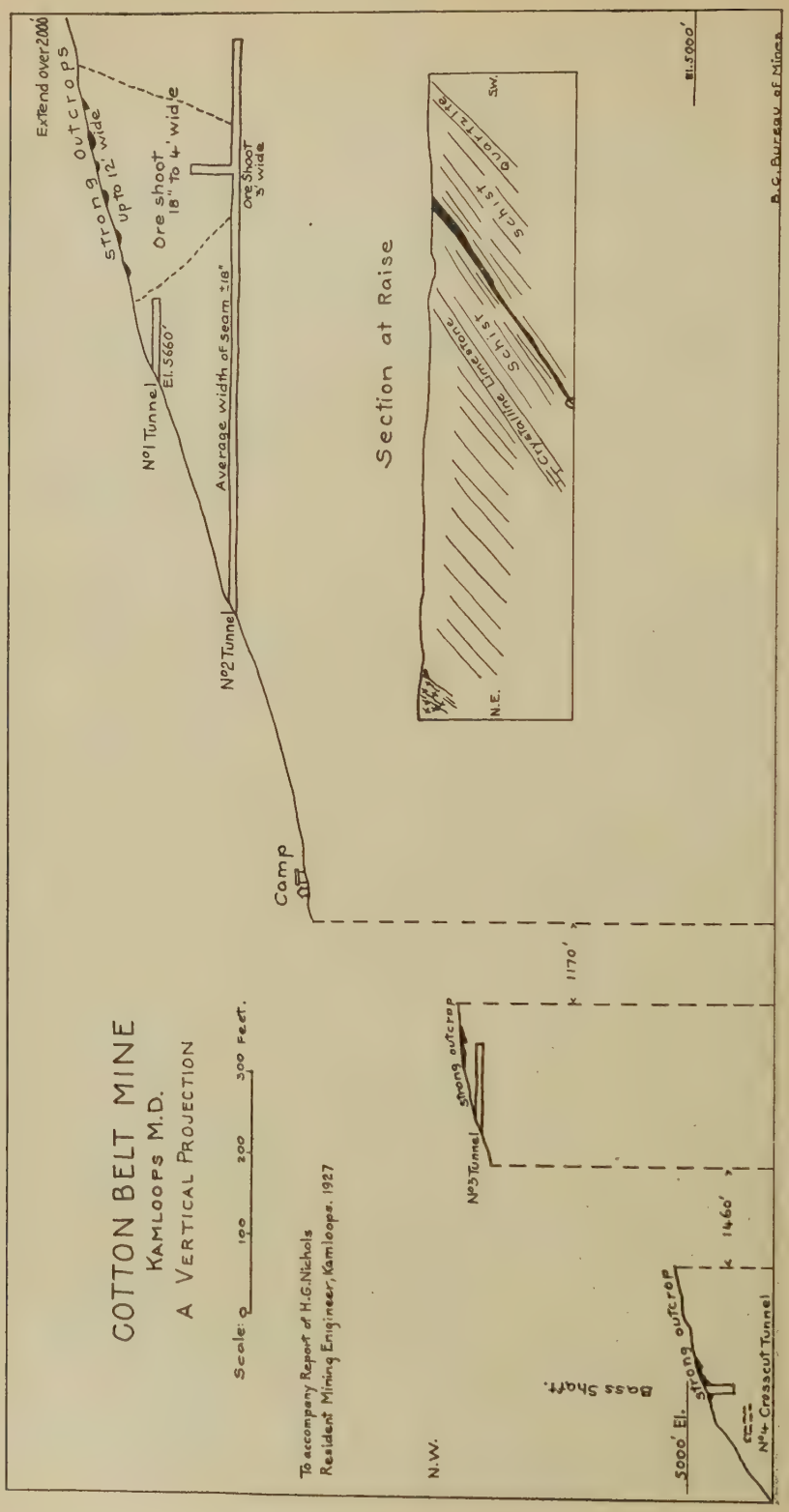
A sample of an 8-inch seam lying on the foot-wall side of the ore-body at the bottom of the shaft assayed: Gold, trace; silver, 11.4 oz. to the ton; lead, 59 per cent.; zinc, 2 per cent.

No. 4 tunnel is being driven to intercept the ore-body below the shaft, and it is anticipated that from this point of attack the more important developments on the *Cotton Belt* property will be conducted. This tunnel has been driven 81 feet, not having yet reached the ore-body, which should be encountered in a further distance of about 10 feet.

Underground developments to date have been spread over a distance along the mineralized seam of approximately 4,200 feet and surface-stripping has exposed the seam at intervals over a further distance of about 2,000 feet to the south-east. There is therefore no question as to the continuity of the mineralized seam, but a considerable amount of development is required for the assurance of a sufficient tonnage of ore to make a paying mine.

The major chances of tonnage are in connection with the occurrences of lenses or ore-shoots in the mineralized seam, such as that developed above the No. 2 tunnel.

So far as prospecting has been carried up to the present time, the results have indicated five or six of such lenses along the entire length of the outcrop.


COTTON BELT MINE
KAMLOOPS M.D.
A VERTICAL PROJECTION
Scale: 0 100 200 300 Feet.
To accompany Report of H.G. Nichols
Resident Mining Engineer, Kamloops. 1927
Extend over 2000'
Strong outcrops
up to 12' wide
Ore shoot
18" to 4' wide
Ore Shoot
5' wide
No 1 Tunnel
El. 5660'
Average width of seam 18"
No 2 Tunnel
Camp
Section at Raise
Crystalline Limestone
Schist
Quartzite
Schist
S.W.
N.E.
El. 5000'
B.C. Bureau of Mines
1170'
No 3 Tunnel
Strong outcrop
1460'
Bass Shaft.
N.W.
5000' El.
Strong outcrop
No 4 Crosscut Tunnel

On the north-westerly half of the line the outcrop is masked by overburden, but, allowing for this, the normal habit of the ore occurrence would seem to be one of a recurrence of swellings or lenses at intervals of from 200 to 500 feet, the mineralized seam in the intermediate distances being of considerably lesser, and in places of negligible, width.

The work in the No. 2 tunnel, which constitutes the main development so far, reproduces the surface conditions fairly well, with the exception that the maximum width of surface exposure does not occur at this horizon. At one point between the portal and the raise the tunnel appears to pass over an ore-shoot, while ore struck in the face seems to be the downward extension of another lens.

A rough estimate of the ore developed by this tunnel is 20,000 tons, and accepting the above interpretation of the ore occurrence, it might be calculated that the *Cotton Belt* mineral-zone down to the level of the No. 4 tunnel could be ultimately responsible for a supply of approximately 1,000,000 tons of ore.

It is hardly possible that such a supply of lead-zinc mineral would remain unexploited, even were there no other available sources of supply associated with it, but it must be remembered that the grade of ore proven so far is low, and the margin of profit on operation is largely dependent upon market conditions and prices. The critical character of this dependence upon the price of metals may only be lessened by the development of reserves calculated to justify large-scale operations, with attendant reduction of costs of operation.

In connection with the question of further sources of supply, there is another well-defined mineral-seam that has been traced over the surface for a distance of about 1,000 feet in a series of open-cuts at a distance of approximately 3,000 feet from the *Cotton Belt* vein to the north-east.

This ore-body has been called the *Complex* vein. A tunnel has been driven on it for a distance of 65 feet at an elevation of about 4,200 feet. The ore in this tunnel is 7 feet wide and is largely composed of magnetite.

A sample taken across the ore-body at the face of the tunnel assayed: Gold, trace; silver, 1 oz. to the ton; copper, 0.3 per cent.; lead, trace; zinc, 2 per cent. And a sample taken at the portal assayed: Gold, trace; silver, 5.4 oz. to the ton; copper, 2 per cent.; lead, 12 per cent.; zinc, 18 per cent.

Intermediate between the *Complex* and *Cotton Belt* ore-bodies there is an 8-foot vein of quartz through which chalcopyrite is scattered irregularly, known as the *Copper* vein. A tunnel has been driven for 140 feet on this vein, and some diamond-drilling was carried out some years ago by the Granby Consolidated Mining, Smelting, and Power Company.

It is evident that the realization of the economic value of the property depends upon development on a scale of greater magnitude than it has been possible to attempt up to the present time.

By dint of an amount of effort that reflects high credit upon those in charge of operations, the difficulties of transportation were overcome to the extent of taking in and installing a small compressor which was used in the driving of the No. 2 tunnel and raise. The results of the development to date, however, supporting as they do the view of ore occurrence as outlined above, do not justify a centralization of activity at this point at the present time, while the extent of the lateral range of the area for development precludes the practical utilization of the limited equipment for the supply of compressed air for power-drills at the different points of attack.

It is under these circumstances that F. W. Guernsey, the consulting engineer, has advised that all work shall be done by hand and on a contract basis, as a temporary expedient, and meanwhile measurements of the flow of water in Deep creek are being taken with a view to the utilization of this source of power for operating a compressor of a capacity in proportion to the major requirements of development.

Should the results of this work, which is being carried on through the winter, indicate, as is suggested, that the No. 4 tunnel should constitute the main point of attack for this development, it is probable that the main camp would be placed at about this horizon and a wagon-road to the property would be imperative.

Already a trail on a good grade has been surveyed and almost completed, by which the bad ground and heavy grades of the old pack-trail are avoided and which cuts off several miles of the distance from Seymour Arm.

### Sicamous Section.

**Victory.** A group of five claims under this name has been located on the west shore of Mara lake. There is a silicified zone about 9 feet wide in garnetiferous gneiss in which some slight zinc mineralization occurs. The formation is

understood to represent a low horizon of the ancient rocks of the Shuswap terrane. The silicified zone strikes across Black point, a promontory about 1¼ miles in length that juts out into the lake on the west side. The strike is about 35° to the west. A tunnel has been driven along this zone for 28 feet from a point at the south end of the promontory at about 10 feet above the level of the lake, following a fairly well-defined hanging-wall which has a northerly strike and a dip to the west. At a distance of a few feet from the portal zinc-blende is said to have been found distributed in small quantities fairly well through the whole width of the zone exposed in the tunnel and a shipment of about 41 tons of this material was made to the Trail smelter. Returns from this shipment are not to hand, but it is understood that they did not come up to the owner's expectations.

There is no sign of this material in the face of the tunnel or for some feet back from the face. A 1-inch seam in the face of the tunnel was pointed out by the owner as representing all that was left of the higher-grade material. This is a rusty seam with a little pyrite mineralization in which no particular indications of valuable content were noted. A sample was taken from this seam which assayed as follows: Gold, *nil;* silver, *nil;* zinc, *nil.* A sample was also taken across 8 feet of the silicified zone at the face of the tunnel, from which the following assay was obtained: Gold, trace; silver, 0.2 oz. to the ton; zinc, *nil.* The silicified zone is characterized by a considerable development of pegmatite.

The operations have been financed by a private company, the members of which are resident in Calgary, Alta., and the work has been done under the direction of A. Collins. A small camp has been erected, three men being employed on the property, and a railway spur 100 feet in length has been laid down from the Sicamous–Vernon tracks of the Canadian Pacific Railway.

### Kamloops Section.

**Iron Mask.** Operations at this mine, situated 6 miles west of Kamloops, have been continued throughout 1927. A reconstruction of the company was effected in the early part of the year, the new company being entitled the Continental Copper Company. A. Wallinder continues still to fill the position of manager. The work has been devoted mainly to the continuation of development, but the flotation plant was also put in operation and ran for a short period, with the production of an amount of a 22-per-cent. copper concentrate that was shipped to Trail, having an estimated gross value of about $16,000.

*Copper Creek Cinnabar.*—This property, which is still being operated in a small way by Fleetwood Wells, was examined by a Californian engineer, and it is understood that tests of the low-grade material upon which recent prospecting has been concentrated are being made with a view to outlining a possible scheme of treatment.

**Victor.** A mineral claim of this name has been located by H. Stephens, of Kamloops, covering an auriferous seam in the Cache Creek formation near Beresford, a few miles to the south-west of Kamloops. Several quartz-seams occur in this formation near the contact with an intrusive stock of granite. Some of these veins have been found to carry occasional values in gold, but no degree of continuity has been established for them up to the present time.

Samples taken from the seam on this claim afford some encouragement for further prospecting. The seam occurs in a zone of shearing on which a shaft has been put down for a few feet below the surface. Three samples taken at this point, where the mineralization appears to be confined to a width of 3 inches, assayed as follows: (1.) Gold, 0.50; silver, 0.30. (2.) Gold, 0.40; silver, 0.40. (3.) Gold, 0.60; silver, 0.40.

### *Non-metallics.*

A deposit from which some samples were taken that indicated certain bleaching properties, and from which it was thought that the material might be classed as fullers' earth, occurs at the head of Tranquille creek at a distance of about 12 miles from the Canadian National Railway at Copper Creek.

Further investigation and sampling does not bear out this interpretation of the character of the deposit, which appears to be a silt in which some proportion of a rather high silica content is in the form of diatoms.

An analysis of a representative sample that was taken from a shaft put down to a depth of 14 feet through the deposit was analysed, with the following result:—

Shaft No. 3: $SiO_2$, 68.2 per cent.; $Al_2O_3$, 12.49 per cent.; $Fe_2O_3$, 3.71 per cent.; CaO, trace; MgO, 0.90 per cent.; $H_2O$, 105° Cent., 7.08 per cent.; Vol. and Org., 11.92 per cent.

The deposit is of considerable extent and within the limits to which it has been prospected by a number of shafts and open-cuts the amount proven may be estimated at around 175,000 tons.*

*Gypsum.*

The operations of the B.C. Gypsum Company at Falkland were continued throughout the year, a total amount of 24,000 tons having been mined from the deposit and shipped to the company's works at New Westminster.

ADAMS LAKE SECTION.

There has been a marked increase of prospecting activity in this field during the past year, following two discoveries on the east side of Adams lake.

**Elsie and White Swan.**

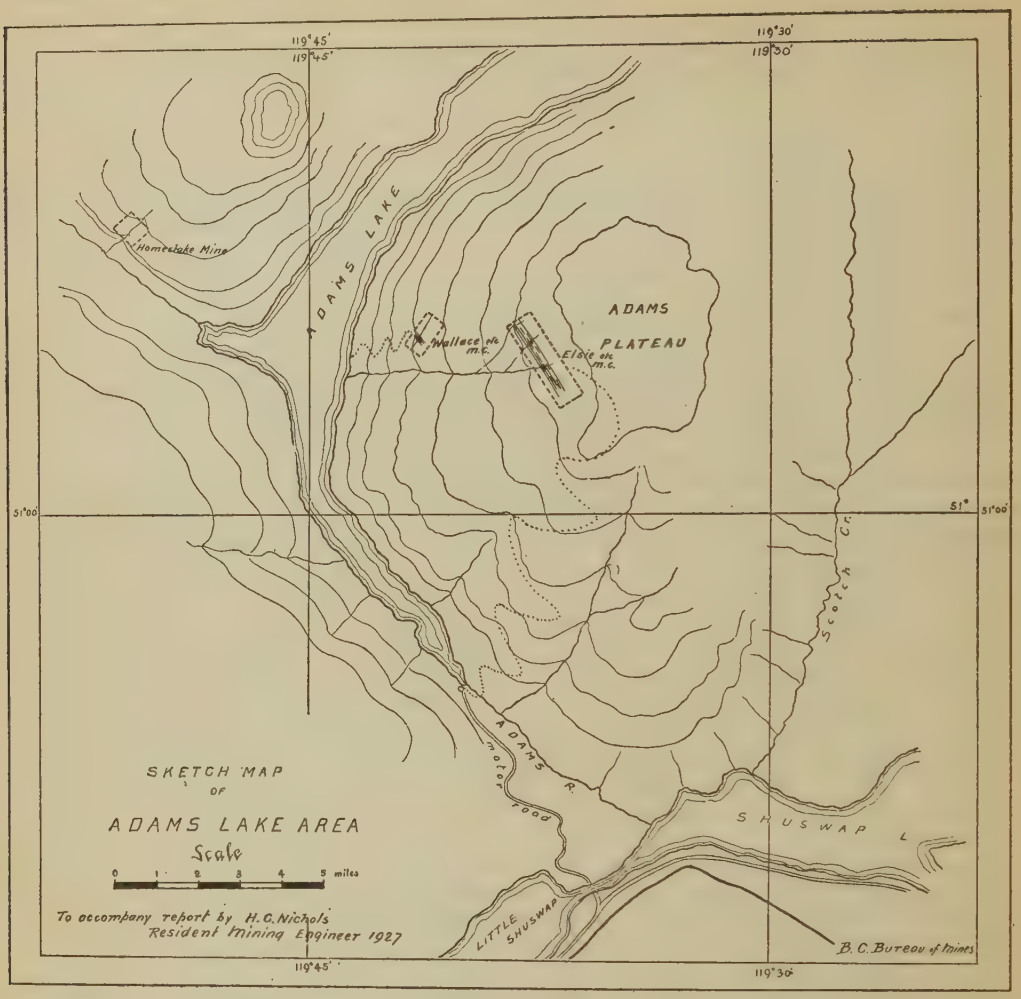
A number of claims have been located near the summit of Adams plateau, at an elevation of about 6,000 feet, by T. Callahan, H. McGillivray, and associates, of Chase. These claims have not been grouped and are known as the *Silver Dollar*, *Lucky Spike*, *Billie*, *Elsie*, *White Swan*, *Golden Eagle*, and *Lucky Coon*, and they cover a mineralized zone extending in a north-easterly direction for about 2 miles. Very little prospecting has been done, work having been devoted chiefly to the construction of an excellent pack-trail of about 13 miles leading from Adams lake. A series of mineralized seams lying conformably with the sedimentary rocks of the Shuswap series and having a flat dip to the west has been exposed in the beds of a number of small creeks flowing down the western slope of the mountain bordering Adams lake on its east side. From the natural exposures it would appear as though there are three parallel seams lying within a width of about 450 feet. One of these seams is exposed along the face of the hill for a distance of about 150 feet on the *Lucky Coon*, where it has a width of from 2 to 4 feet. A few tons of ore have been broken from this outcrop, on which there is a small open-cut. A sample of some of the selected ore from the dump that had been put aside for shipment assayed: Gold, 0.02 oz. to the ton; silver, 14 oz. to the ton; lead, 62.6 per cent.; zinc, 4.6 per cent.; and a sample taken from the open-cut assayed: Gold, 0.02 oz. to the ton; silver, 13.6 oz. to the ton; lead, 9.2 per cent.; zinc, 9.6 per cent.

The exposure next in importance to the foregoing is found on the *Elsie*, in the bed of Stillman creek. At this point a well-defined seam of solid mineral having a dip of 32° to the west is to be seen on both sides of the creek and in its bed. A sample taken across a width of 16 inches assayed: Gold, 0.04 oz. to the ton; silver, 11.6 oz. to the ton; lead, 24 per cent.; zinc, 9.6 per cent.; and another sample taken across a width of 10 inches on the foot-wall side assayed: Gold, trace; silver, 22.6 oz. to the ton; lead, 46.4 per cent.; zinc, 8.4 per cent. This exposure is about 4,000 feet south-west of the *Lucky Coon* outcrop and appears to be on a parallel seam lying about 350 feet to the west. Intermediate between these two outcrops two parallel seams are exposed in the bed of another small creek on the *Golden Eagle*, where a width of 4 feet appears to be indicated in a succession of strata at slightly different horizons. A sample of this seam assayed: Gold, 0.04 oz. to the ton; silver, 22.5 oz. to the ton; lead, 36.2 per cent.; zinc, 9.2 per cent.

The lower seam exposed in this creek, which is probably not more than 12 inches wide, assayed: Gold, trace; silver, 15 oz. to the ton; lead, 18.6 per cent.; zinc, 9.6 per cent. These exposures are more or less along the same line as the *Lucky Coon* outcrop and at a further distance of about 800 feet to the south-west.

There is a further exposure on what appears to be the same seam on the *White Swan*. A sample taken across 16 inches at this point assayed: Gold, trace; silver, 4.8 oz. to the ton; lead, 0.4 per cent.; zinc, 4.6 per cent. Indications of the same seams may be traced still farther to the south-west over the *Billie* and *Lucky Spike*, although no work has been done to open them up. Some good-looking mineral is also found on a small cut on the *Elsie*, which appears to indicate a third seam lying in the foot-wall some 200 feet from the other two. As a prospect

* A material was examined similar in appearance to the deposit mentioned above, and which was found to be an impure diatomite containing about 25 per cent. diatom silica and the remainder in the form of volcanic silts, such as rhyolites, andesites, etc. It is reported to be suitable as a substitute for fullers' earth and possesses bleaching qualities both for crude oil and lard.




this occurrence is encouraging and is decidedly deserving of attention. On account of the fact that the seams dip with the hill and that there is very little covering of overburden, it would be possible to obtain valuable information in regard to their continuity on the surface at small cost and a little diamond-drilling might go far towards establishing their economic importance. It is for this reason that the property may be cited as a typical business prospect in which a possibility may be more or less definitely proved or disproved at a proportionate cost.

**Wallace.** This mineral claim is situated on the east side of Adams lake at an elevation of 2,000 feet above the lake and some 3,000 feet below and approximately 4 miles due west from the *Elsie*. The property has recently been bonded to interests represented by William McAdam and operations have been in progress during the latter part of 1927. A body of mineral has been exposed in an open-cut in a brecciated zone of rock which now occurs as a kaolinized chlorite. The mineralization appears to be identified with a cross-fracture which intersects the tufaceous beds at an oblique angle and concentration occurs as a replacement at the particular point, to which attention has been devoted, in a bed particularly favourable to deposition. As to whether the particular fracture identified with this body of ore is one of a series or whether other similar beds favourable to deposition occur cannot be stated in view of the limited amount of work that has been done. A crosscut tunnel is being driven to intercept the ore-body at a depth of about 100 feet below the outcrop and the information gained in the course of this work should go far towards determining the continuity and direction of the ore occurrence.

Summit Mine, Kamloops M.D.

Summit Camp, Clearwater River, Kamloops M.D.

Pioneer Mine Plant, Lillooet M.D.

Cotton Belt Camp, Kamloops M.D.

At the time of the inspection some ore had been sacked for shipment and a sample of this assayed: Gold, trace; silver, 10 oz. to the ton; copper, 6 per cent.; lead, 17 per cent.; zinc, 14 per cent. A sample of picked ore from the open-cut assayed: Gold, trace; silver, 10.2 oz. to the ton; copper, 5.5 per cent.; lead, 10 per cent.; zinc, 14 per cent.

A small open-cut has been made on the cross-fracture at a distance of about 200 feet from the open-cut, where there is a width of 2 feet of mineralized rock. A sample taken from this point assayed: Gold, trace; silver, 4.40 oz. to the ton; copper, 2 per cent.; lead, 4 per cent.; zinc, 5 per cent.

A camp has been constructed on the property and six men are employed in driving the tunnel. The work is being continued through the winter.

**Evelyn and Venus.** This group, comprising the *Evelyn*, *Venus*, and *Helen*, located by C. F. Johnson, George Elkholm, and August Ekstrom, of Magna Bay, is situated 10 miles from Magna Bay on the summit of Crowfoot mountain, flanking Manson creek on the east at an elevation of about 5,000 feet. Two prospect-shafts have been sunk and there is also some open-cut work upon some outcrops of ore that occur as replacements in a series of bands of limestone interbedded with the Pre-Cambrian schists. The ore-deposition appears to be related to a system of east-west fracturing, the general trend of the formation being north-westerly. There appear to be several of these limestone-beds and further prospecting is justified. The ground was covered with snow at the time of the inspection and it is not possible to say more than that the grade of the ore encountered is one of the small lenses upon which the sinking has been done is encouraging. A sample of this ore assayed: Gold, trace; silver, 16 oz. to the ton; lead, 28 per cent.; zinc, 17 per cent.

**Homestake.** The operations in progress during the past two years were suspended in November, 1927, and the option held upon the property was relinquished.

In addition to stoping, a certain amount of exploratory work was carried out, mainly with a view to locating further bodies of shipping-ore on the eastern end of the workings and on both sides of the fault. The schistose-seam, on which the main stope was carried, was found to die out as it approached the fault, but on the tunnel-level another barite-seam with good values was picked up in the hanging-wall. The bad state of the ground did not permit of working this seam from the drift where it was encountered, and it was approached from a crosscut driven through the fault from the main adit; a short raise from the face of this crosscut encountered the ore as anticipated and it was found to be from 3 to 4 feet wide at this point, but lying very flat.

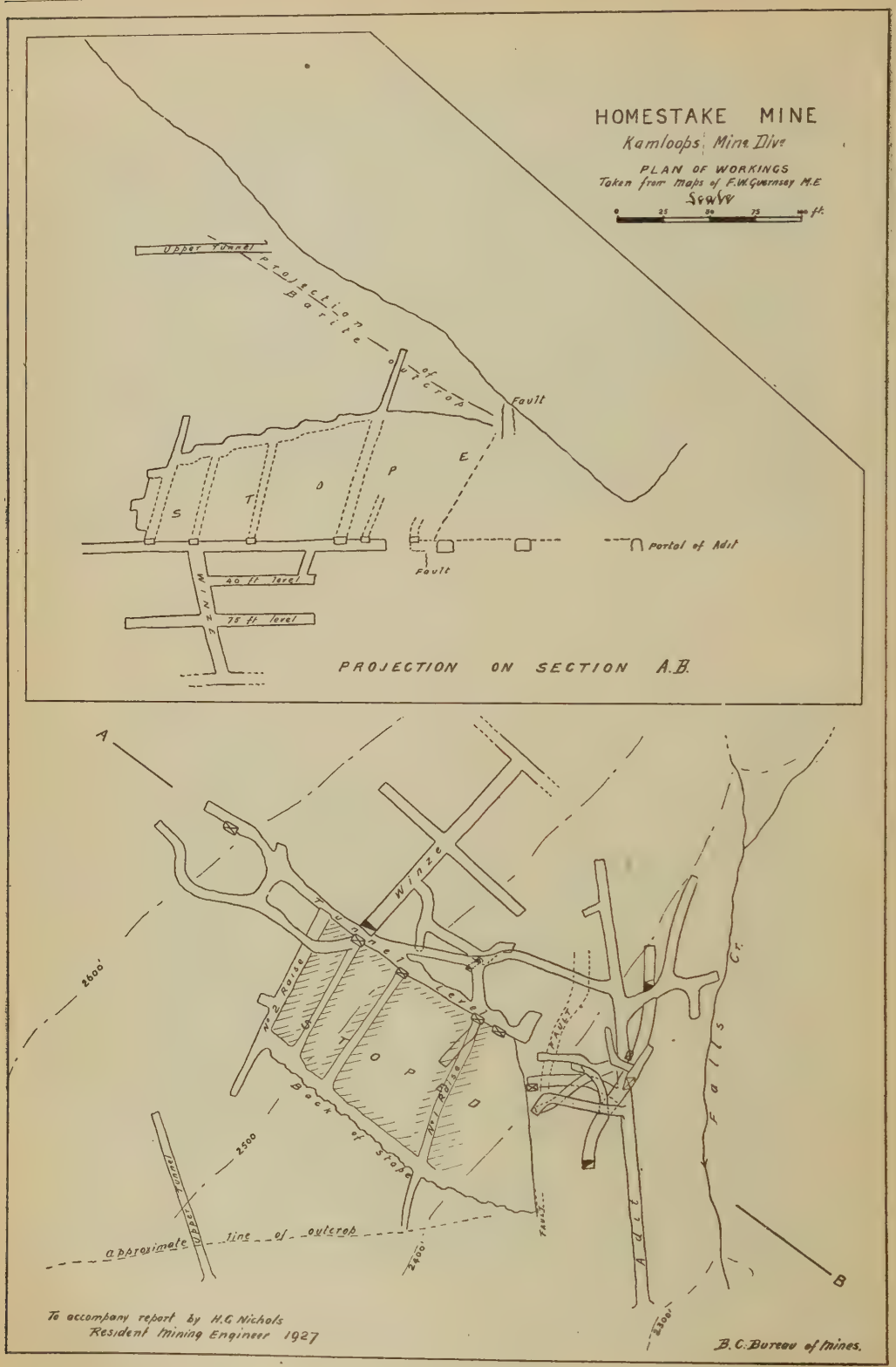
The occurrence of this high-grade ore close up to the fault on its western side encouraged the view that further ore of similar character was to be found on the eastern end of the stope in the triangular section remaining between the stope and the fault and extending above the tunnel-level up to surface, and exploration along these lines was continued with a view to maintaining shipments. Similarly, an attempt was made to locate ore appearing at the surface on the eastern side of the fault by tunnelling from an old raise from the east drift and by crosscutting into the hanging-wall from a point just beyond the winze on the tunnel-level.

Operations below the tunnel-level on the 40-foot, 75-foot, and 150-foot levels were discontinued as a result of the failure to locate ore of higher grade than about 25 oz. silver to the ton, notwithstanding the proven continuance in depth of the barite-seams and occasional patches of higher-grade ore. Shipments gradually fell off in amount and grade.

Following the abandonment of these operations, which were devoted mainly to the winning of ore of shipping grade, an examination was made by F. W. Guernsey at the instance of the owners, to whose courtesy is due the inclusion of the following extracts from his report. It is stated:—

"The ore-minerals in order of importance are tetrahedrite, galena, and sphalerite. In addition, there are varying amounts of argentite, native silver, ruby silver, chalcopyrite, and sometimes native gold. Pyrite is also usually present. These minerals are contained in or are closely associated with several lenticular bodies of barite and to some extent also with quartz veins when these latter are close to the barite. Silver is the mineral of most value and from determinations made by other investigators it is found chiefly in the tetrahedrite, but is also present in the galena. . . .

"All of the barite-lenses contain ore-minerals in fairly constant quantity. These may appear scattered through the barite or they may appear in fine stringers more or less paralleling the


HOMESTAKE MINE
Kamloops Mine Div.
PLAN OF WORKINGS
Taken from Maps of F.W. Guernsey M.E.
Upper Tunnel
Projection Barrie
Outcrop
Fault
Portal of Adit
40 ft level
75 ft level
PROJECTION ON SECTION A.B.
A
B
2600'
2500
Winze
Tunnel
Back of Stope
Approximate line of outcrop
Falls Cr.
To accompany report by H.G. Nichols
Resident Mining Engineer 1927
B.C. Bureau of Mines.

contacts. In this manner certain parts of the barite-lenses are richer than others, but there does not at present appear to be any continuity to these rich streaks. . . .

"Above the larger barite-lenses and separated from it by varying thicknesses of schist is a rich streak of ore that apparently has been the main object of the recent mining operations. This rich streak varies from a few inches to 24 inches in thickness and appears to be more schistose than does the ore in the barite-bodies, which is quite massive. From indications noted on the surface and in the underground workings this schistose ore is not continuous over the whole barite-lens, but is apparently best developed where quartz lies, above or below the barite.

"The barite-lenses apparently diverge as they are traced to the west and the width of the lenses decreases also in this direction.

"The barite in the outcrop known as the 'Barite Bluff,' so far as could be seen, does not appear to persist in its full width for any distance. At the outcrop this barite has a width from 20 to 30 feet and grades upward into schist with small stringers of barite. At the bottom the contact is quite sharp, with quartz cutting the schist and spreading out beneath the barite. The prolongation of this outcrop could not be traced owing to surface covering, but it appeared to narrow very rapidly in both directions.

"The barite-lenses are displaced by one rather wide fault-zone and are cut off to the east, near the stream, by other faults. Although barite stringers are known to occur to the east of these faults and have been observed to outcrop to the east of the stream, no lenses comparable to those in the ore-zones have been found to the east. . . .

"The discovery was evidently made in the first instance by the exposure of a number of bands of mineralized barite on the steep side of the gulch cut by Falls creek, a tributary of Sinmax creek . . .

"The statement is made that from the earlier working of the barite 600 mine-cars from the main raise averaged 0.04 oz. gold to the ton and 15 oz. silver to the ton, also that in the year 1894 20 tons was shipped which averaged 79 oz. silver to the ton.

"Later on it was recognized that the schistose-streak overlying the barite carried very appreciable values in silver, lead, and zinc, and it is from this streak the so-called black ore making the bulk of recent shipments has been taken. The ore shipped in 1926 and 1927 amounted to 2,770 dry tons, carrying about 0.09 oz. gold to the ton, 80 oz. silver to the ton, 3 per cent. lead, and 8 per cent. zinc, the smelter valuation being $129,000, or $46.50 a ton. This was extracted from an area stoped above the main tunnel of approximately 17,000 square feet, so that the average thickness of the vein extracted and shipped from this area is estimated at 15 inches. That the pay-ore has not all been extracted is shown by the fact that the streak is shown in the back of the stope, on the main level 45 feet west of No. 2 raise, and on the 40-foot sub-level. The barite-bands, cut in the main workings west of the fault, carry silver averaging between 5 and 6 oz. to the ton, and the schist separating the pay-streak from the barite carries about 5 oz. silver to the ton. . . .

"A measured section of 8 inches of the pay-streak, 40 inches of schist, and 48 inches of barite, or a total of 96 inches, averaged 10 oz. silver to the ton. A sample across 72 inches in the back of the stope averaged 34 oz. to the ton. East of the fault shown on the map the pay-streak is not in evidence. The barite in the main raise carries low silver values, but, as mentioned, old records show an average of 15 oz. to the ton from a number of cars extracted. . . .

"The barite-lenses carry values with enrichments in places. . . . It may be confidently expected that in handling a greater tonnage and with further development a not inconsiderable amount of the barite ore will be profitable to work. . . .

"The workings are wholly on the *Homestake* and consist of a crosscut tunnel at an elevation of about 2,300 feet, driven to cut the vein at a depth of 90 feet vertically below the nearest outcrop, drifts along the strike of the vein to the west, two winzes below the tunnel-level, together with several raises to the surface, and minor crosscuts. Several small tunnels have been driven to cut at shallow depth outcrops shown on the surface and a number of open-cuts made where exposures of the barite were uncovered. . . .

"The major portion of the underground work was done a number of years ago and the greater part of this stands up well. The stoping and sinking of the main winze has been done within the last two years. The stope has been back-filled and a number of the chutes caved, preventing a close examination. In the winze, which is said to be sunk to a distance of 150 feet on the dip, water had reached to a point about 60 feet from the collar and only that portion of

the winze which was exposed and the 40-foot level could be examined. While caving has taken place at a number of points, particularly in the stopes, the main openings at the present time are quite passable and no sign of swelling ground was observed. The physical condition of the mine for the resumption of work is better than was expected. . . .

"West of the fault the pay-streak was exposed along the main level for about 180 feet. Between 140 and 150 feet of this exposure has been stoped for a distance up the pitch of around 105 feet. From the back of the stope at No. 2 raise to the surface the distance is over 250 feet. At the eastern end the back is only a short distance from the surface. This could not be determined owing to caving. . . .

"It may be said there is an area between the back of the stope and the surface of 32,000 square feet, or nearly double the area from which ore has been extracted. Below the main level is an area above the 40-foot sub-level of 6,000 square feet. There is therefore an area of possible ore above the tunnel-level of 38,000 square feet. This would mean about 5,000 tons per foot of thickness. If 4 feet were mined it would amount to about 20,000 tons. . . .

"With the exception of the work on the winze and the extension of the left drift west, no development or exploratory work appears to have been done by the last operator. The mine was worked as a leasing proposition and the pay-shoot which had been developed was partially extracted, the object being to get the ore with very little regard to the future working. . . .

"The reason for giving up the option is not clear. The property has produced upwards of $129,000 worth of ore; the pay-streak has not all been extracted; virgin ground extends from the back of the stope to the surface, and the evidence is that the pay-ore continues throughout this area. The pay-streak is found west of the manway to the stope, and while it pinches out to the west it is reasonable to assume that on further development-work it will be picked up again and other ore-shoots opened out. Good ore is found on the 40-foot sub-level, so that the limit of the main ore-shoot has not been reached.

"It is regrettable that the winze could not be examined on account of water, and before the prosecution of further work the winze should be unwatered so that an examination may be made of the lower levels. . . . It is considered that the ore should be concentrated on the ground and only the concentrates shipped, thus cutting down the truckage and freight charges."

Mr. Guernsey concludes his report by expressing the opinion that the property is an interesting one and of unquestionable value.

## CLINTON MINING DIVISION.

### Taseko (Whitewater) Camp.

**Spokane, Motherlode, Mohawk, and Tenessee.**

These mineral claims have attracted attention since the time that the area was brought into prominence by the discovery of a rich gold-deposit on the *Windfall* in 1920. Failure to establish continuity for the latter occurrence, coupled with the fact that the mineral-deposits on the opposite side of the Taseko valley were considered to be of a different character, robbed the situation of that stimulus to activity which otherwise might have brought about more rapid development; nevertheless, the owners of these properties have persisted in their efforts at prospecting, in face of outstanding difficulties in the matter of accessibility.

The distance from transportation has undoubtedly militated against the opening-up of this camp, more especially as the route via Bridge river passes over a divide of about 7,000 feet.

In regard to the classification of the ore-bodies, a considerable amount of geological investigation has been devoted to the area, and the work of V. Dolmage in particular has done much to elucidate the nature of the mineralization. The consequent renewed interest shown in the camp has resulted in the commencement of active investigation of certain properties by the Consolidated Mining and Smelting Company of Canada, Limited.

As a result of these investigations it now appears that while the surface exposures of the ore-bodies are of a radically different character, there are grounds for believing that the several occurrences of mineral found on the properties on the south side of the valley and on the *Windfall*, on the north, respectively, are not unrelated to one another.

The distinction between the two sets of occurrences lies primarily in the fact that the ore-bodies on the south side occur in fracture-zones of a quartz diorite, while those on the *Windfall* are found in siliceous tuffs of the Denain formation.

In regard to the latter, the following extract from Dolmage's report (*see* Summary Report of the Geological Survey of Canada, 1924, Part A) may be given here:—

"The gold occurs both in eluvium and in a small tourmaline vein from 2 to 6 inches wide. The eluvium, as well as the outcrop of the vein, is confined to an area of a few hundred square feet situated on the south-east side of the canyon of Battlement creek. The only rocks in the vicinity are a thick bed of silicified tuff and two quartz-porphyry dykes about 12 feet wide, one of which is exposed in a tunnel about 70 feet south-east of the vein and the other on both sides of the canyon about 200 feet north-east of the vein. The bed of tuff is several hundred feet thick, is exposed for 10 or more miles east of the deposit, and dips at an angle of about 20° to the north. At many places throughout its length the tuff has been almost completely altered to silica and its original dark-green colour changed to pinkish-white. The silicification is confined to wide bands, some of which are vertical and others parallel to the bedding of the tuff. The latter are the larger and in places constitute almost the entire exposed thickness of the tuff. Well-formed crystals of pyrite up to half an inch and averaging more than a quarter of an inch in diameter are plentifully disseminated throughout the tuff in both the silicified and unsilicified parts. The quartz-porphyry dykes are cut by a set of closely spaced cracks parallel to their walls and have been altered to a pure white, very fine-grained material in which the original quartz phenocrysts are clearly visible. Small veins of talc less than half an inch wide were observed cutting the silicified tuff in many places.

"The eluvium consists of iron-stained clayey material and small angular fragments of silicified tuff rendered porous by the leaching of the pyrite crystals.

"Three tunnels were driven by the bonding company, two on the south-east side of the creek immediately south-west of the area covered by the auriferous eluvium and one on the north-west side of the creek. These are in silicified tuff carrying much pyrite and several small irregular patches of pink or pale-greyish tourmaline. No gold values, however, were found, except in one or two small seams of white gouge less than half an inch wide. A few high assays were obtained from very small samples scraped from these seams.

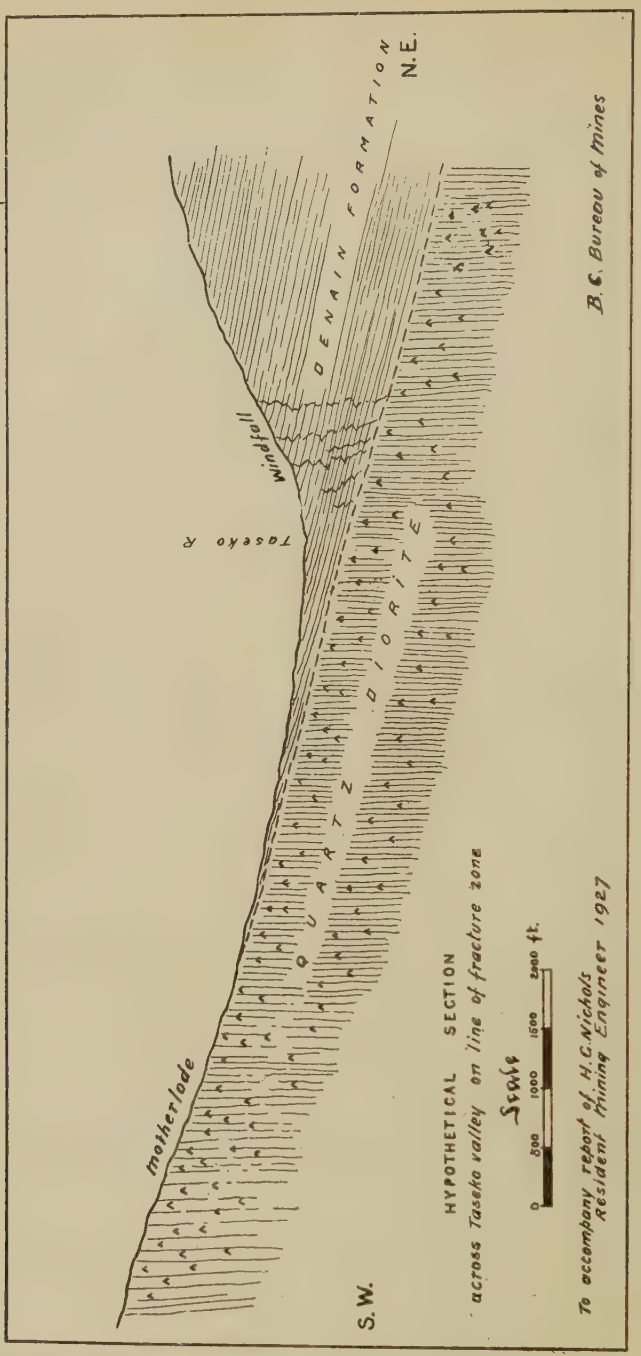
"The gold seems to have been concentrated by the action of surface solutions, but the amount found in the eluvium appears to be much too large to have been derived from so small a vein dipping at such a low angle. The association of tourmaline and rutile indicates that the vein was formed at high temperatures by rising solutions and, therefore, probably at a considerable depth. The vein is not, therefore, in any way related to the present surface and it would not be impossible for it or similar veins to occur at some depth below the present exposures. The eluvium has not been transported any great distance from its source."

The *Motherlode-Mohawk-Tenessee* group is situated at a distance of approximately 9,000 feet south-west from the *Windfall* and covers a fracture-zone in the quartz diorite having a strike directly in line with the latter occurrence. This zone is approximately 100 feet wide and is described by Dolmage as follows:—

"Within these zones the quartz diorite is cut by an intricate ramification of small quartz veins averaging not more than half an inch in width. The quartz diorite is altered to sericite, epidote, and other minerals. In the quartz veins and to some extent in the quartz diorite are small amounts of pyrite, chalcopyrite, galena, and zinc-blende. On the surface these have been altered to limonite, azurite, malachite, and cerussite, and in places small specks of native gold were seen. From the oxidized surface material considerable amounts of gold can be panned and high assays have been obtained."

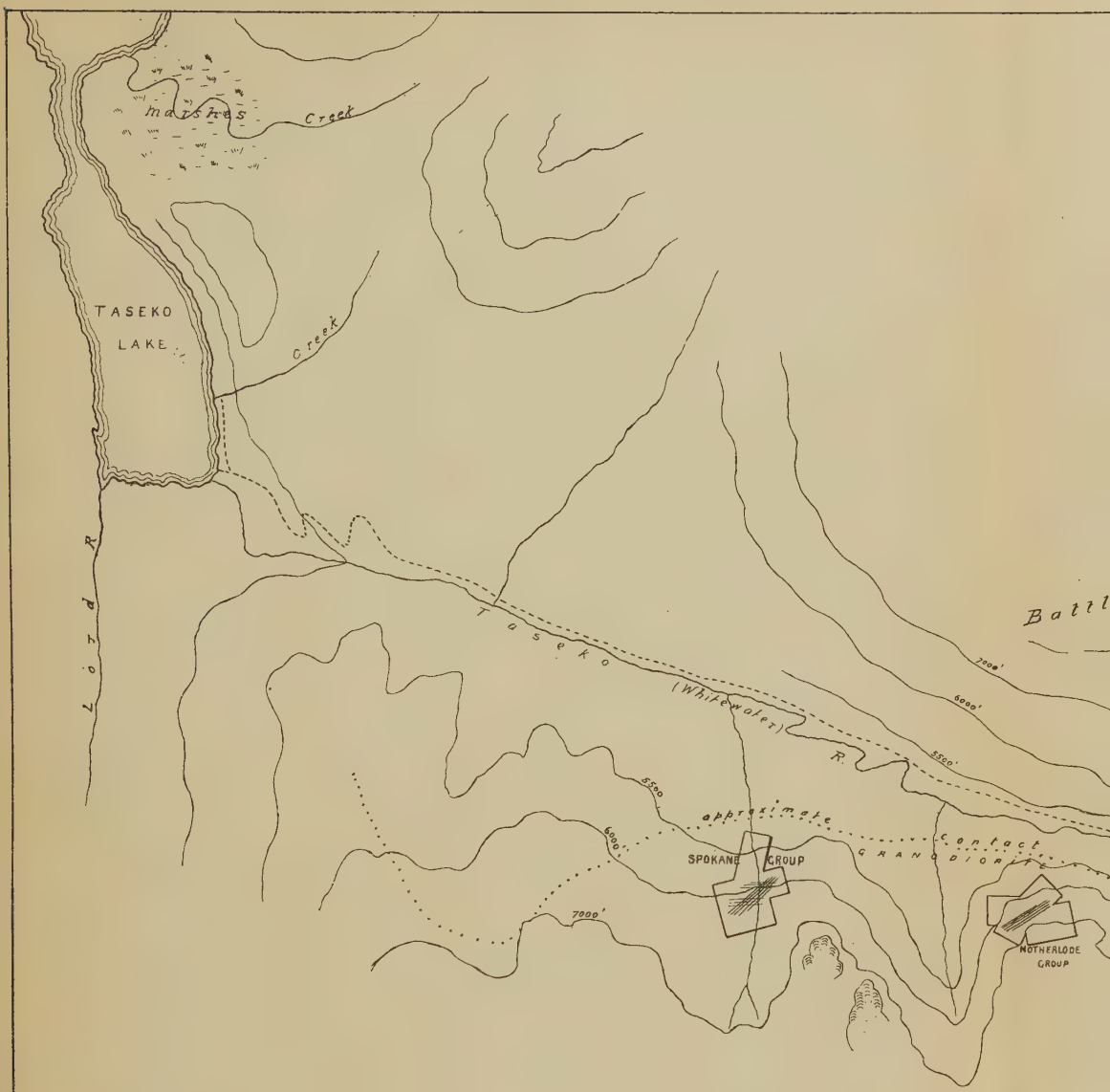
The relationship between the two deposits indicated above may be recognized by reference to the attached hypothetical section across the Taseko valley along the direction of the fracture-zone.

The boundary of the batholithic rock mapped on the surface does not represent a steeply dipping contact, but rather the thin edge left by erosion of the intruded formation lying over the granitic rock that continues below it at a gentle angle. It may very well be that this well-defined and prominent fracture-zone in the granitic rock persists to the north-east below the overlying formation, and that the mineralization on the *Windfall* owes its origin to this underlying source. Dolmage has stated with reference to the *Windfall* occurrence: "The vein is not in any way related to the present surface"; and the same general consideration may apply to the whole depth of approximately 900 feet of the Denain formation lying over the fracture-zone in the batholithic rock at this point.




The connection thus indicated at once provides a suggestion in regard to depth development on the *Windfall* and affords grounds for encouragement in relation to the possibilities of valuable content of the fracture-zone that may have constituted the prime agency in the formation of the rich *Windfall* deposit.

Some prospecting-work and sampling was carried out by the Consolidated Mining and Smelting Company during the past season. The best opportunity was afforded on the *Motherlode*-




# WHITEWATER (TASEKO R) CAMP

CLINTON MINING DIVISION

Scale

0 1 2 3 miles

To accompany report by H.G. Nichols
Resident Mining Engineer 1927

123° 30'
123° 00'
122° 30'
122° 00'
WILLIAMS LAKE
P. G. E. Rt
52° 00'
MOTOR ROAD
CHILCOTIN R.
Olkali L.
meadows water
Tatlo Lake
Tatlo Lake
water
creek
TASEKO LAKE
Taseko R.
Lord Downe
Warner Pass
Taylor Pass
Gun Cr.
Gun L.
CHILCOTIN PLATEAU
FRASER R.
51° 00'
P. G. E. Rt
MOTOR ROAD
BRIDGE R.
SETON L.
LILLOOET
RUGGED PEAKS OF COAST RANGE
7000'
7000'
WARNER PASS
Trail down Gun Cr.
to Bridge R.
INDEX MAP
Scale
0 5 miles 15
122° 30'
122° 00'
B. C. BUREAU OF MINES

*Mohawk* group, where a series of open-cuts practically crosscuts the whole width of the zone. On the *Mohawk* the following three samples were taken from different cuts:—

(1.) Across 3 feet of gouge on foot-wall: Au, 1.20 oz.; Ag, 1.06 oz.; Cu, 2.14 per cent.

(2.) Across 4 to 7 feet from foot-wall: Au, 0.87 oz.; Ag, 0.75 oz.; Cu, 1.88 per cent.

(3.) Across 0 to 8 feet from foot-wall: Au, 0.31 oz.; Ag, 0.65 oz.; Cu, 4.56 per cent.

Samples from the *Motherlode* assayed traces of gold and from 0.19 to 0.72 per cent. copper.

The direction of the fracture zone or zones on the *Spokane* is not so clearly outlined in the open-cut work that has been done. It is possible that there are two intersecting zones, for one of which a width of from 60 to 100 feet appears to be shown by the surface workings.

Samples taken over an apparent width of 10 feet in several cuts assayed: Au, 0.06 oz.; Ag, 2 oz.; Cu, 5.8 per cent.; and samples taken over a distance of 24 feet in another cut assayed: Au, 0.04 oz.; Ag, 0.46 to 2.52 oz.; Cu, 0.78 to 1.77 per cent.

The character and extent of these mineral-zones renders the work of prospecting a task of no mean order, and it is matter for congratulation that it is to be undertaken by a company so well equipped to carry it out to the final issue. The first step towards the undertaking was the provision of a better means of access in order that supplies and machinery might be delivered on the ground at as early a date as possible in the coming season.

As has been mentioned, the high passes on the Bridge River route constitute an insuperable obstacle to the early commencement of operations, and the Consolidated Company decided to make use of the longer but easier route by way of Williams Lake and the Chilcotin plateau by the construction of a new trail on the east side of Taseko lake. An inspection of this route was made; the total distance from Williams Lake to the camp is about 180 miles. The first 65 miles is over a good motor-road to Hanceville, on the Chilcotin river, where an excellent general store is maintained by C. Spencer, of the Chilko Ranch, from whom every assistance was obtained for the further journey. Thence to the Taseko river, at a point about 16 miles below the lower or north end of Taseko lake, there is a rough wagon-track that could be converted into a truck-road. From this point the trail follows round the steep hillside flanking the river and over a roughly glaciated surface until the lake is reached. An old trail crosses the river (by ford at low water) and, passing round the far side of the hills on the west side of the lake, comes back to it again at the narrows, where it crosses to the eastern side. It is to avoid this double crossing that the Consolidated Company has undertaken to construct a 16-mile trail along the lake to the narrows. Half this distance is comparatively easy going; the remainder is bad. From the narrows the old trail meanders across some bad swamp land, but it is hoped that this may be avoided by continuing the new trail by a long detour skirting the ranges on the east. After passing the swamps the trail is good as far as the upper end of the lake, and for the remainder of the distance has recently been put in excellent condition.

### Placer Gold.

Some minor operations have been continued on the gold-bearing gravels of Ward Bar and Watson Bar creeks.

A group of five placer bench leases situated on the left bank of the Fraser river on the High Bar Indian Reserve No. 1 has been acquired by a company trading under the name of Marmon Mine, Limited. Some speculative estimates of production have been made by this company based upon results obtained from some selected samples and it is stated that the ground is to be thoroughly tested. Work to this end was commenced on the property late in 1927.

### Non-metallics.

The deposits of hydromagnesite, magnesite, soda, and Epsom salts were visited during the season, but there are no new developments to be reported; the occurrences are described by L. Reinecke in Geological Survey of Canada Memoir No. 118.

#### *Refractory Clay.*

An extensive deposit of clay situated on the Chilcotin road about 3½ miles from Williams Lake has been worked and several car-loads of the material have been shipped to the B.C. Refractories, Limited.

This company reports that the deposit includes a white-burning shaly clay that with certain admixtures makes a fine tile or earthenware body; hard flint-like material that burns to a deep-red colour but sustains a very high temperature; and a yellowish flinty clay that has

apparently been formed through the breaking-down of the flint-like ridge. This clay withstands a temperature above cone 31 and is being used in the manufacture of high-temperature furnace-lining, which is supplied in its plastic state and fired in place with the production of a monolithic lining. A certain proportion of the clay is calcined and the calcined and raw materials so proportioned in the process of manufacture and so graded in size that upon drying and firing practically no shrinkage takes place.

Further development of the industry in the direction of the manufacture of firebricks will depend upon proof of extent of the suitable clay-seams. The whole deposit is of considerable thickness and it is stated that the material in all of the seams, with one exception, will withstand temperatures ranging between cone 26 and cone 31. The material of the remaining section shows marked signs of fusion at cone 10, at which temperature it presents a glassy appearance, burning to a grey colour; if fired at the proper temperature it would form a good tile body, where white colour was not an essential consideration.

## YALE MINING DIVISION.

**Independence.** This copper property, owned by J. Holmes and associates, was bonded by the Consolidated Mining and Smelting Company and a certain amount of work was done in investigating the possibility for continuance of the higher-grade ore that was found in the tunnel-workings. As pointed out in the 1926 Annual Report, this ore is identified with a system of fracturing in the granite porphyry. Zones of crushing also occur in which a lower grade of copper mineralization is found. Considerable work was done in constructing a trail from Coquihalla Station, and it is understood that further prospecting of the property will be resumed during 1928, subject to satisfactory arrangements being made with the owners.

**Aurum.** This group, formerly known as the *Idaho*, owned by A. E. Raab and associates, of Hope, is situated on the South fork of Ladner creek in the same mineral-zone upon which the *Emancipation* mine is located. The open-cut work that was commenced in 1926 was continued, and encouraging results were obtained from the panning of the soft oxidized material lying between a persistent body of quartz and a decomposed serpentine formation which occurs on its foot-wall side. The quartz is found to continue in close association with this contact, at no place, so far as has been exposed by prospecting, being at a greater distance than 25 feet from it. Gold values in varying amount are found in the quartz, the greater concentration apparently being on the foot-wall side. The property was bonded by the Dominion Ore Concentrating Company, of New Westminster, which planned to drive a tunnel in on one of the lower exposures, from which crosscutting would be carried out in both directions.

The outcrops occur within a vertical range of about 500 feet and the strike of the vein, which has a steep dip to the north-east, is directly into the hill. There is thus an excellent opportunity for cheap development.

**Pipe Stem.** Preparations were made during 1927 for a renewal of operations upon this property, situated near the top of the divide on the south side of the main fork of Ladner creek. Some high values are reported to have been found in a series of small quartz stringers occurring in a very broken and disturbed schist formation. These results are said to have been obtained from surface workings which were carried for a distance of about 200 feet in a north-westerly direction. A 35-foot shaft was put down at one time on this outcrop and there is also a tunnel and raise to surface. More recent work was the driving of a tunnel at a depth of about 50 feet below the outcrop in an attempt to follow the high-grade stringers. This tunnel has been driven for 105 feet in a semicircle. A small Ross mill has been put on the property and there is a crude ropeway arrangement for delivering small quantities of ore to it. The trail to the property was greatly improved.

**Emancipation.** The development of this property, situated at Jessica, on the Kettle Valley Railway, and owned by W. Thomson, of Hope, has not been pushed ahead as it deserves. The main tunnel was advanced to its intersection with the big quartz ledge, and at this point work was suspended and another tunnel was commenced with the object of intersecting the hanging-wall ore-body near the surface. As pointed out in previous reports, the development of the property should be attacked at a lower horizon and this has not yet been attempted. The property is controlled by the Director Mining Company, of Vancouver.

Skaist River—Looking East up to Hope Pass.

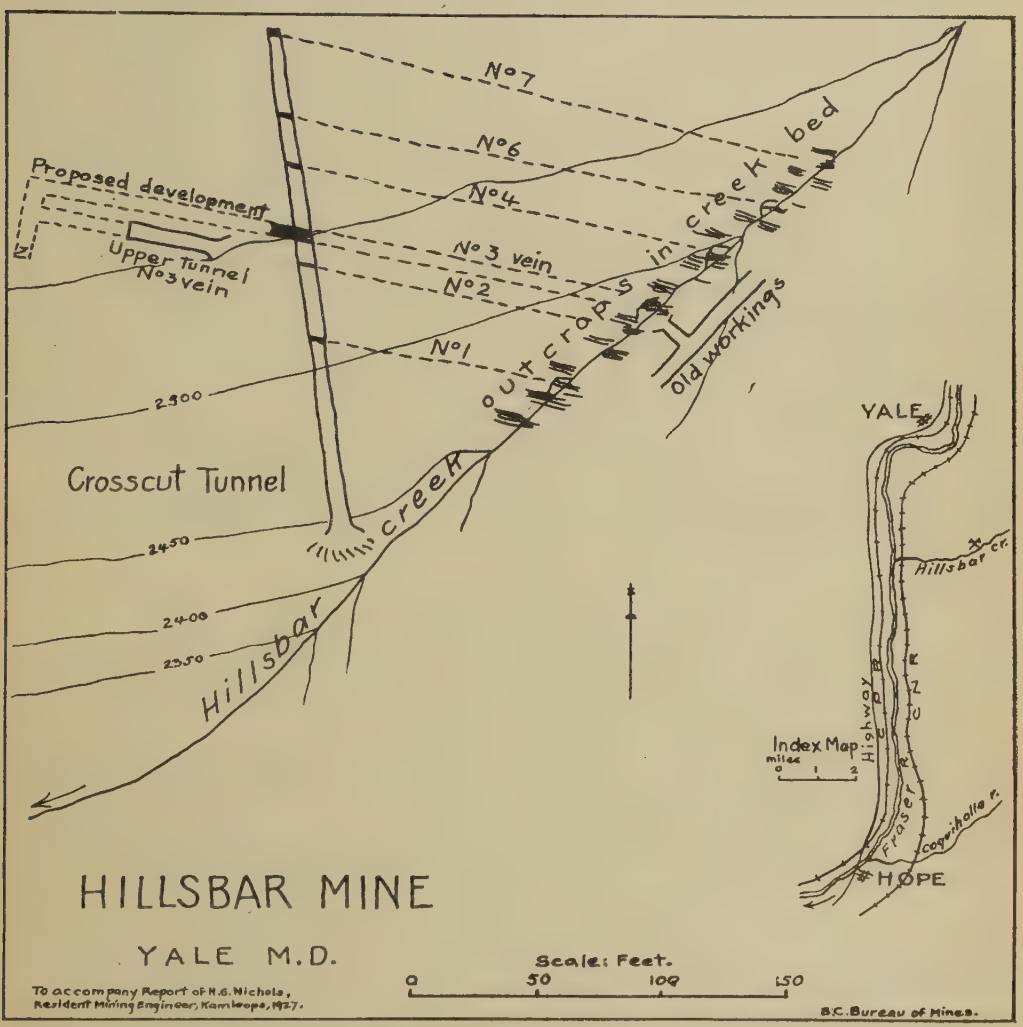
Hope Summit, Dewdney Trail, Yale M.D.

Silver Daisy Mine, Skagit River.

Skagit River at 23-Mile, Yale M.D.

**Hillsbar.**

The development of this property, situated on Hillsbar creek, a tributary of the Fraser river on the west, a few miles below Yale, has been actively continued by the Hillsbar Mining Company under the superintendence of E. Strom. A quartering crosscut tunnel has been driven from a point on the north side of the creek, below the series of quartz-exposures that are found in the bed of the creek, in order to intercept all of the veins on their north-westerly strike. There are in all seven fairly well-defined veins in the bed of the creek, in a distance of about 110 feet, in some of which visible gold is found in notable quantity. These quartz veins lie parallel with the enclosing slates and vary in width from a few inches to about 3 feet. On account of the irregular way in which




the individual veins, as exposed in the creek-bed, appear to pinch and swell, the opinion has been expressed that, although no single vein might be depended upon to persist for any distance either laterally or in depth, there might be probably a zone of slaty rocks enclosing a succession of gold-bearing quartz stringers in sufficient amount to provide a basis for economic mining and treatment on a scale of low-grade operations. The object of the tunnel was to ascertain in the first place whether continuity of the individual veins might be expected.

Six well-defined veins have been cut in this tunnel, which has been driven into the hill for a distance of 197 feet. With one exception the position of the veins in the tunnel corresponds with the outcrops as exposed in the creek-bed. Attention has been devoted chiefly to the develop-

ment of what is known as the No. 3 vein, which is cut at a distance of 114 feet in from the portal of the tunnel, at a distance of 135 feet on its strike from the creek exposure. Another tunnel has been drifted in on this vein at a vertical height of 100 feet above the crosscut, and at a distance of 125 feet along the strike of the vein from the point at which it is intersected in the crosscut. This vein has been drifted on for 90 feet. The average width is 3 feet and the average grade of ore is reported to be $20. A sample taken across this No. 3 vein in the crosscut assayed: Gold, 0.82 oz. to the ton; silver, 0.10 oz. to the ton. A sample taken across the No. 2 vein, which is intersected at a distance of 10 feet south of the No. 3 vein, assayed: Gold, trace; silver, trace.

Free gold is an occasional occurrence in all the veins. The values are by no means uniform. The management reports that an average of $7 to the ton has been obtained from sampling a width of 11 feet across the No. 5 vein, including country-rock on both sides, and that a sample taken over a length of 7 feet of the No. 3 vein in the upper tunnel had an assay value of $1.40. These veins occur in a slate formation near a granodiorite contact. Altogether some 295 feet of crosscutting and 90 feet of drifting-work has been done by the present company since the commencement of its operations. Five men are employed and a camp has been constructed, including office building, blacksmith-shop, cook-house and bunk-house with accommodation for twelve men. A sum of approximately $15,000 has been spent on the development.

Future plans provide for the further development of the No. 3 vein by drifting to the north-west and raising to connect with the tunnel above, with a view to blocking out ore before proceeding with the installation of the mill. Further machinery is to be installed in the early spring for carrying on this work. The company has also taken an option on the *Emmigrant*, situated near the head of the South fork of Siwash creek. A considerable amount of work was done upon this property in the years 1916 and 1917, when a stamp-battery was installed. A small amount of ore was passed through this mill taken from a quartz vein which is said to have reached a width of 20 feet in places. Samples from this vein, as reported at that time, assayed between $1.60 and $9 to the ton in gold and silver. Another big quartz lead is reported to be exposed on the surface about 150 feet west from the portal of the tunnel on the *Emmigrant*. The Hillsbar Mining Company has started a drift easterly from the old workings on the *Emmigrant*, where the vein is stated to be 3 feet wide, showing visible gold.

### 23-Mile Camp.

A considerable amount of prospecting has been carried on recently upon the claims in this camp, which is reached over the Hope–Princeton trail and is situated at the junction of the Sumallo and Skagit rivers. The area included within this camp is occupied by greenstone and a cherty limestone formation surrounding a stock of granodiorite, with heavy mineralization of iron minerals, pyrite, and pyrrhotite. The whole formation is fractured to an extent that has given rise to widespread oxidation of the iron, resulting in a rusty coloration to which Red mountain owes its name. Some massive bodies of pyrrhotite occur and minerals of lead, copper, zinc, tungsten, and molybdenum are also found.

**Silver Daisy.** High-grade silver-lead ore occurs in a narrow vein of quartz intersecting the chert formation and dipping 60° to the west. A sample taken across 6 inches in the upper (40-foot) tunnel assayed: Gold, 0.02 oz. to the ton; silver, 72 oz. to the ton; lead, 10 per cent.; zinc, 10 per cent. A sample taken across 2 inches in the upper tunnel at the face assayed: Gold, 0.04 oz. to the ton; silver, 133 oz. to the ton; lead, 20 per cent.; zinc, 24 per cent. A sample taken from the face of the lower (105-foot) tunnel, 15 feet vertically below the upper tunnel, across 1.5 inches assayed: Gold, 0.08 oz. to the ton; silver, 25 oz. to the ton; lead, 3 per cent.; zinc, 3 per cent. And a sample in the same tunnel across 8 inches, 30 feet back from the face and immediately under the ore in the tunnel above, assayed: Gold, trace; silver, 9 oz. to the ton; lead, 2 per cent.; zinc, 4 per cent.

**Mammoth.** The mineralization on this claim occurs along a direction of shearing that parallels the contact with the granodiorite at a distance from it of about half a mile. Pyrrhotite is the principal mineral, and associated with it are sphalerite and some scheelite. Indications of nickel are found also. The formation is a lime-silicate rock. A sample taken across 8 feet in a short crosscut tunnel assayed: Gold, trace; silver, 1 oz. to the ton; zinc, 6 per cent.

**Rainbow.** Three mineralized zones occur paralleling the granodiorite-contact on the west and at distances ranging from 1,200 to 1,700 feet from it. The most easterly is identified with a steeply dipping system of fracturing in silicified limestone. A sample taken from a 2-inch seam in the face of a short tunnel assayed: Gold, 0.12 oz. to the ton; silver, 20 oz. to the ton; lead, *nil;* zinc, 2 per cent. A sample taken across 4 feet in an open-cut above the tunnel assayed: Gold, 0.02 oz. to the ton; silver, 11 oz. to the ton; zinc, 2 per cent.

The middle zone occurs in a 9-foot seam of altered limestone between two well-defined walls, in which a 3-inch seam of solid mineral occurs; 8⅜ tons of ore from this seam sent to the Trail smelter in 1914 is reported to have yielded a return of: Gold, 0.06 oz. to the ton; silver, 15.7 oz. to the ton; copper, 0.70 per cent.; zinc, 2.8 per cent. In the western zone chalcopyrite is found disseminated through the limestone.

**Dingo.** This claim is located on the granodiorite area where there is some shearing. Molybdenum is found as scales in tight vertical fractures. A short tunnel has been driven on a 6-foot zone, in which there is some mineralization on the left-hand side. A sample taken across 14 inches at this point assayed: Gold, trace; silver, 2 oz. to the ton; copper, 2.5 per cent.

Further prospecting-work has been done on the *Defiance* and on the *Bell*, described by C. E. Cairnes in the Geological Survey Summary Report for 1920, Part A, where outcrops of massive pyrrhotite occur. The impression created in regard to this camp is that the wide spread of the mineralization resulting from the intense fracturing of the whole formation lying around the mass of intrusive granite may betoken a possibility for the discovery of ore of economic importance at some depth.

### Placer-mining.

#### *Fraser River.*

*Americanadian Dredging Company.*—After a few weeks' operation the plant on this company's property was closed down, it being found that the drag-line equipment was not capable of dredging the gravel from the bed of the Fraser river.

#### *Peers Creek.*

It is understood that the placer properties on this creek owned by J. Fulbrook and associates have been bonded and that arrangements have been made for an early start of operations in the spring.

## ASHCROFT MINING DIVISION.

### Steyn Creek.

A group of claims covering extensive outcrops of quartz in which visible gold occurs in places has been located up the valley of Steyn creek. The exposures are found at an elevation of about 6,000 feet and up to an elevation of about 9,000 feet. The property has been bonded by D. J. Stewart, of Vancouver, but owing to the shortness of the season during which work can be carried out at these high elevations no development-work was carried out during the year, and it is not possible to form any estimate of average content.

### Scottie Creek.

A bond has been taken by interests connected with the automobile trade on the group of claims situated on this creek, a tributary of the Bonaparte river, at a distance of 23 miles from Ashcroft. These claims cover deposits of chromite which have been exposed in a series of open-cuts and in a small tunnel. The occurrence is described by W. Thomlinson in a report to the Munition Resources Commission, Ottawa, and published in the Final Report of the Commission on page 177. The particular attraction of this deposit lies in the occurrence of the chromite in disseminated form throughout masses of the peridotite rock, in addition to lenticular bodies of chromite which occur in massive form in serpentine.

The opinion has been expressed that the occurrence of the disseminated ore is of sufficient extent to warrant milling operations. A further deposit of chromite is found farther down the

Bonaparte valley at a distance of about 7 miles from Ashcroft. This deposit was reported upon by W. F. Ferrier and by R. W. Thomson, former Resident Mining Engineer of the district.

Samples from this ore-body, which occurs as masses in the serpentine formation, yielded upon assay about 10 per cent. of chromic oxide.

### Placer-mining.

The Barton Dredging Company has been operating below Lytton with a new device for extracting gold from the gravels of the Fraser river. The operation has as yet to prove itself a success.

A group of three bench leases has been located by D. J. Stewart, of Vancouver, on the Fraser river below Texas creek, and it proposed to work the gravel by hydraulic methods, water for the purpose being drawn from Texas creek.

## NICOLA MINING DIVISION.

**Leadville.**

This group has been located on a discovery of silver-lead ore on Iron mountain, 4 miles east of Merritt, and at an elevation of about 5,200 feet above sea-level. This mountain owes its name to the occurrence of a number of veins of specular hæmatite which traverse the altered volcanic rocks in different directions. The discovery of the silver-lead ore was made early in 1927 by the late Emmett Todd, a veteran prospector.

The outcrop of this ore-body does not show much mineralization; it is represented by a zone of crushing and shearing with a heavy replacement by barite. The strike of this zone is about 25° E. and the dip 80° to the west. It has been traced over the surface for several hundred feet and at the point where development-work is in progress is 10 feet wide. A shaft was sunk on this baritic zone and at a depth of a few feet below surface there was found to be a marked increase in the galena content. A sample of the barite, in which no galena was observed, assayed 0.60 oz. silver to the ton.

The sinking of the shaft was continued and is still in progress. At a depth of 30 feet a sample taken across the full width of 10 feet assayed: Gold, trace; silver, 2 oz. to the ton; lead, 8.4 per cent.; zinc, 3 per cent. Another sample across 6 inches on the foot-wall side assayed: Gold, trace; silver, 3.4 oz. to the ton; lead, 31 per cent.; zinc, 2.4 per cent.

At a depth of 50 feet the shaft is carried down on the hanging-wall and there is a width of 3 feet which is well mineralized, there being 2 feet of heavy barite gangue towards the foot-wall which is not exposed. A sample taken across 3 feet at this depth assayed: Gold, trace; silver, 1.4 oz. to the ton; lead, 18 per cent.; zinc, 2 per cent. A sample of ore taken from the dump assayed: Gold, trace; silver, 3 oz. to the ton; lead, 24 per cent.; zinc, 1 per cent.

Sinking has been continued and at a depth of 70 feet a sample of heavy sulphide ore assayed: Gold, trace; silver, 2 oz. to the ton; lead, 60 per cent.; zinc, 1 per cent. At this depth it is reported that the ore-body is 5 feet wide, containing a large proportion of ore of shipping grade.

The property is under bond to a Seattle syndicate and V. Vigelius is in charge of operations. It is proposed to continue the sinking of the shaft to a depth of 100 feet and then to drift both ways on the lead, which is exposed in open-cuts at 50 feet to the south and 100 feet to the north, in which there is a similar width of the barite-outcrop. At a distance of approximately 1,000 feet west of the shaft there is a short 8-inch seam of heavy lead mineral in a fracture with an east-and-west strike and dipping at a low angle to the south.

The whole formation is strongly fractured and the area of iron mineralization extends for about 1,500 feet towards the south, where some small occurrences of galena associated with barite are also found. There are ample grounds for the development of the well-defined mineral-zone upon which operations are in progress. The property is reached either from the Princeton or Coldwater road; from the former a branch road leads to the Howarth Ranch, from which point there is a trail for the remaining distance of 2 miles; from the Coldwater road there is a wagon-road to within 3 miles of the camp, and a well-graded continuation of this road is under construction with the assistance of the Department of Mines.

**Planet.**

There are no further developments to report upon this property at Stump lake, which is held by Planet Mines, Limited. The company has been engaged in moving the camp buildings to another site in anticipation of operations on a more extended scale.

**Mary Reynolds.** This property, to which attention has been called on several occasions (*see* Minister of Mines' Report for 1917, page 229) on account of the occurrence of high-grade silver mineral in one of a series of quartz veins occurring in the Nicola greenstone, was bonded by J. L. Brown, of Victoria, and some further surface prospecting has been done. Plans for future operations have not been disclosed.

*Vimy Ridge.*—Some further exploratory work has been carried out on this property, but no further developments are reported.

*Thelma, Lucky Mike, and Almeda.*—The camp in which these claims are situated, 12 miles north of Nicola, possesses some attractive features. There is a series of narrow siliceous veins with lead, copper, and zinc content and with associated gold and silver values. Vancouver interests have been engaged in carrying on development.

### Coal.

Lump coal of good quality is being produced from the Middlesboro Collieries at Merritt. The company is operating four mines and the output for the year is approximately 43,000 tons. Operations are not being conducted at full capacity.

## VERNON MINING DIVISION.

**St. Paul.** This property is situated on Monashee mountain, about 5 miles from the 42-Mile post on the Vernon–Edgewood highway, at approximate elevations of from 4,815 to 5,700 feet above sea-level. There are seven claims, of which four are Crown-granted.

Two tunnels at elevations of 4,750 and 4,800 feet have been driven on a lead for distances of 38 and 80 feet respectively. In the upper tunnel, which was the first to be driven, a seam of a high-grade complex ore was followed that varied in width from 2 to 8 inches. A shipment of 22,375 lb. of ore from this tunnel was made to the Trail smelter, having a gross value of $1,074.64, returns of analysis being as follows: Gold, 0.50 oz. to the ton; silver, 147.9 oz. to the ton; lead, 11.15 per cent.; zinc, 0.2 per cent.; antimony, 17 per cent.; sulphur, 17.4 per cent.; silica, 25.4 per cent.; iron, 13.2 per cent.; lime, 0.7 per cent.

The high-grade seam was lost at a distance of 70 feet from the portal of the tunnel, although the lead continued with a well-defined hanging-wall. The lower tunnel was then started and ore continues in it to the face.

The property is owned by the St. Paul Mines, Limited, with offices at Bellingham, Wash., and work, which has been suspended for the winter, is to be resumed as soon as snow is off the ground.

**British Empire.** A bond has been taken on this property near Okanagan Landing, as well as upon the *White Elephant*, on the opposite side of the lake. From the latter spectacular specimens of gold-bismuth telluride have been obtained and it is understood that further development on each of these claims is to be undertaken in 1928.

**Ophir.** Some further open-cutting along the shear-zone that passes through this property on the east shore of the North arm of Okanagan lake, about 7 miles from Vernon, has improved the outlook in regard to continuity of the mineralization. The gold and silver values are low, but there are good chances for the development of a base-metal ore-body, and it is probable, if the property was not situated on an Indian reserve, that plans for its exploitation would have been made before now.

### Mica.

A deposit of mica has been uncovered near Armstrong, where a pegmatite dyke branches out from a zone of pegmatitic rock that occurs between a stock of granitic intrusive and a formation of volcanic tuff.

Small scales of mica are found throughout the zone of pegmatitic rock. The dyke is approximately 100 feet wide and in it plates of mica from 6 to 10 inches long and from 4 to 7 inches wide have been exposed in an open-cut. No other work has been done to investigate the occurrence, but it would be an easy matter to prospect along the course of the dyke which cuts across the base of a hill at a short distance from a wagon-road.

### Placer Gold.

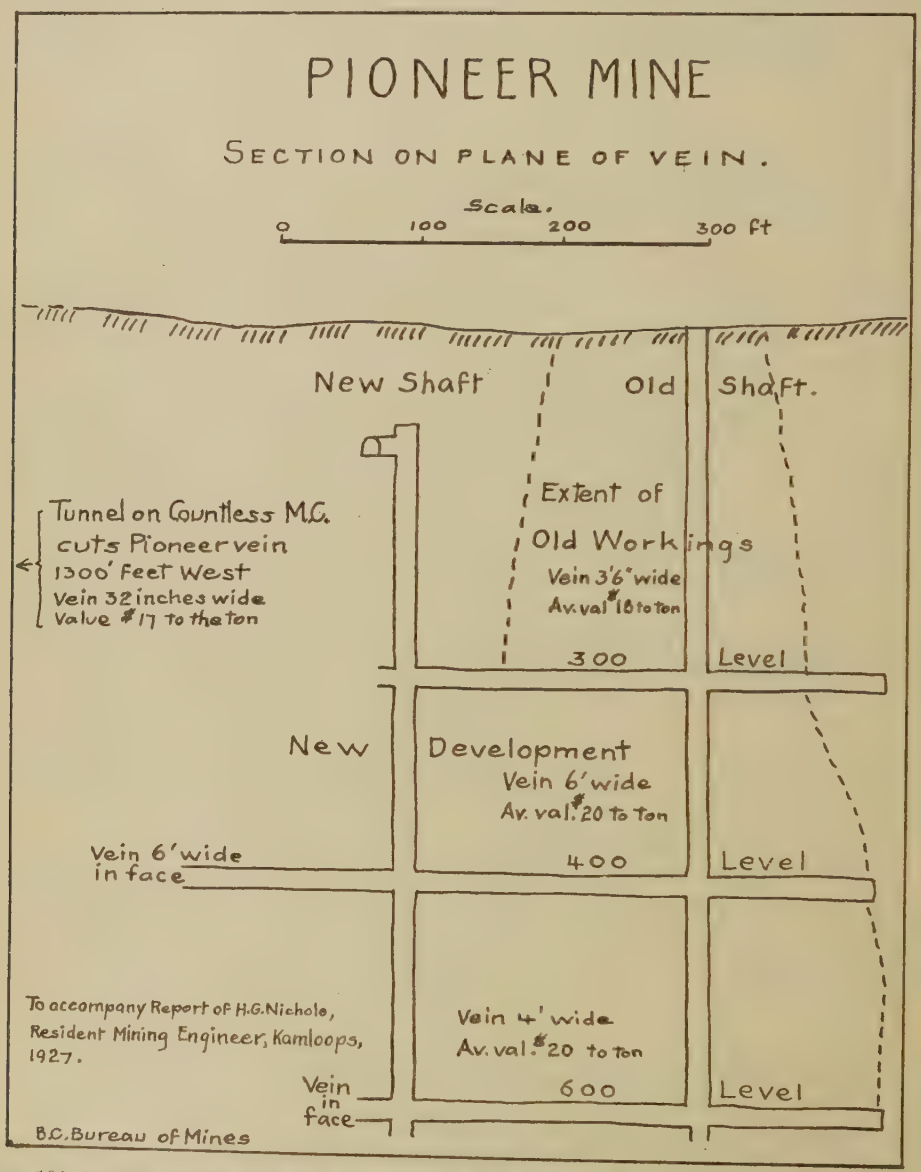
Some testing-work with a Keystone drill is being carried out by B. F. Lundy, who has secured an option covering bench leases on Cherry creek.

## LILLOOET MINING DIVISION.

### Bridge River Area.

**Pioneer.**

The development of this mine, which has been in progress continuously for the past two years and a half, has been attended by eminently satisfactory results and has now reached a stage at which the ore reserves justify plans for operations on a more extended scale. Since the mine was reopened 2,250 feet of development-work has been carried out below the 300-foot level. During the past year 350 feet of shaft-


PIONEER MINE
SECTION ON PLANE OF VEIN.
Scale.
0 100 200 300 ft
New Shaft
Old Shaft.
Tunnel on Countless M.C. cuts Pioneer vein 1300' feet West Vein 32 inches wide Value $17 to the ton
Extent of Old Workings
Vein 3'6" wide
Av. val $18 to ton
300 Level
New Development
Vein 6' wide
Av. val. $20 to ton
Vein 6' wide in face
400 Level
To accompany Report of H.G. Nichols, Resident Mining Engineer, Kamloops, 1927.
Vein 4' wide
Av. val. $20 to ton
Vein in face
600 Level
B.C. Bureau of Mines

sinking, 190 feet of raising, 420 feet of drifting, and 60 feet of crosscutting have been accomplished. The depth of the lowest working (600-foot level) below surface is 553 feet, being 302 feet below the old workings. Above the 300-foot level the total extent of lateral development on the vein was 340 feet. On the 400-foot level the ore-shoot has been developed for a total distance of 510 feet and the face of the west drift is in ore of something better than the average grade and 6 feet wide. On the 600-foot level development has not been pushed so far ahead;

the ore-shoot has been proved for a distance of 360 feet and the face of the west drift is in ore that corresponds with that encountered on the upper (400-foot) level, immediately above it.

In addition to these satisfactory proofs of the continuation of the vein in depth, an increase in the grade of the ore has also been found. In the old workings the average grade of the ore that was mined to an average width of 3 feet 6 inches was approximately $18 to the ton; on the 400- and 600-foot levels and in the stopes below the 300-foot level an average grade of $20 to the ton has been maintained. During the latter part of the year the mill was run on ore won from development on the 400-foot level west drift, which was carried for the full width of the 6-foot vein, and bullion to the value of approximately $16,000 was produced from one month's operations, indicating slightly higher values for the wider portions of the vein. A new vertical 2-compartment shaft, equipped with 10 by 12 hoist and cage, has been put down at a distance of 205 feet west of the old shaft. This shaft does not come up to the surface, but connects with an old adit-tunnel through which the ore will be drawn after being crushed underground. During the year an amount of approximately 10,000 tons of ore has been mined, of an estimated total value of $135,000, the bullion produced amounting to approximately $92,000.

An interesting feature in connection with the continuity of the vein is in connection with a crosscut tunnel on the *Coronation*, referred to later, in which the *Pioneer* vein has been cut at a distance of approximately 1,300 feet west of the present workings. The development of this mine, which has been carried on out of profits derived from the operations, constitutes a creditable record of achievement, in view especially of the inadequate character of the available equipment.

With the provision of the new shaft, further development in depth and to the west can be attacked to advantage, and the satisfactory way in which the ore-body is being opened up amply warrants the equipment and plans for future operations that are nearing completion. This new equipment includes the installation of a new pipe-line to replace the old flume; a compressor, power machinery, and a new mill. The pipe-line is constructed of wood staves manufactured on the ground; it has a total length of 6,550 feet, of which 6,050 feet is 3 feet inside diameter; 250 feet, 2 feet 6 inches inside diameter; and 250 feet, 2 feet inside diameter. A new dam has been constructed on Cadwallader creek and the water is delivered under a head of 271 feet, capable of developing a possible maximum of 1,000 horse-power, the actual requirements amounting to 550 horse-power. There are five Pelton wheels, as follows: One of 261 horse-power for the compressor; two of 125 horse-power each for tube-mill and electric generator, etc.; and two of 50 horse-power each for other mill machinery. The compressor is a Canadian Ingersoll-Rand 2-stage type with a capacity of 1,500 cubic feet of free air.

The new mill, which will have an estimated capacity of from 100 to 150 tons a day, has a floor area of 9,000 square feet and is planned on an all-cyaniding scheme of treatment. The broken ore from the rock-breakers at the collar of the shaft is delivered to a 4- by 5-foot Canadian Allis-Chalmers ball-mill, where it is crushed in cyanide solution. The crushed ore is passed to a classifier and thence to a 4- by 16-foot tube-mill in closed circuit with a classifier. The overflow goes to a primary thickener and thence to three 16- by 14-foot mechanical agitators for a 24-hour treatment. Zinc-dust precipitation is to be used. The mill is well situated below the tailing-dumps, in which there is a total estimated amount of 22,000 tons of a gross value of approximately $100,000. This material is available to be drawn upon as opportunity occurs and as may be called for by the demands of mine development.

In addition to the above new equipment, several improvements have been made in the camp accommodation. A two-story bunk-house, 30 by 54 feet, has been built, improvements have been made to the boarding-house, and four bungalow residences have been built for housing the families of married employees. An average number of thirty men has been employed during the year. The operations are being conducted by David Sloan, to whom is due the credit of the development of the property, and it is understood that the organization of a company is being arranged. H. Cain is mill superintendent. It is expected that operations on the new scale will be commenced early in 1928 and that the production from this property will be more than doubled.

**Coronation.**

The Denver quartz-mill that was installed upon this property during the latter part of 1926 was put in operation in the early part of 1927 and approximately 3,600 tons of ore has been milled. This ore was taken from the *Little Joe* ore-body, upon which further development-work had been carried out as mentioned

in the 1926 Annual Report. A further amount of 500 feet of development-work was carried out in 1927. The ore-shoot is developed to a total depth of 400 feet below the surface. The vein has an average width of 12 inches and an average grade of $13.50 a ton, the ore-shoot being approximately 500 feet in length. The heads delivered to the mill assayed approximately $8 a ton and bullion to a total value of $30,000 was produced during the year.

It is not proposed to continue the development in depth of this ore-body at the present time, a more profitable field for development being indicated in connection with some crosscutting which has been carried out on the *Countless* at a distance of approximately 2,000 feet from the *Coronation* workings. This tunnel was driven, following the diamond-drilling referred to in the 1926 Annual Report, and intersected an ore-body at a distance of 355 feet from the portal which appears to be the continuation of the *Pioneer* vein. At a point where this vein was struck it is 32½ inches wide and assays $17 a ton. This vein is a little to the south of the *Little Joe* vein and is probably identical with the ore-body that had previously been exposed in some old workings on the *Countless*. The elevation of this crosscut is practically at the same horizon as the outcrop of the *Little Joe* ore-body.

The development of this newly discovered ore-body will be watched with much interest in view of its bearing upon the future of both the *Coronation* and the *Pioneer*.

**Lorne.** Although it is understood that further payments have been made on the option held upon this property by Seattle interests, no work has been done during the past year. It is reported, however, that plans for the commencement of operations have been completed which embrace the installation of a mill and extended development.

**Wayside.** A small amount of new work has been done by O. Ferguson upon this property, which is deserving of greater attention than has been paid to it in past years. The veins on this property occur in a detached belt of the same augite diorite in which the Cadwallader Creek mines are found, at a distance of about 8 miles north of the *Pioneer*. Although there is a lithological similarity in the several stocks of the augite diorite that occur in this area, this particular belt, which has been described by W. S. McCann* as being 3,000 feet wide, possesses some characteristic features in connection with the development of a sheeted zone structure. McCann states that "sheeted structure is common and the planes of fractures parallel to the veins are often filled into quartz stringers." A considerable amount of work has been done upon this property in years gone by and it is unfortunate that by far the largest amount has been done upon a plane of fracture that appears to be nothing more than one of these parallel sheeted zones infilled with quartz. Over 1,000 feet of tunnelling has been done in following this fracture-zone, which lies in the hanging-wall of a vein from which high values in gold have been obtained from time to time.

There is a series of four tunnels driven on this vein, in addition to several smaller tunnels and open-cuts, some of which are, and all of which may be, on parallel fracture-zones. The horizontal distance on this vein prospected by the four tunnels above mentioned is approximately 1,000 feet, with a vertical range of about 400 feet. The upper or No. 1 tunnel has been driven for a distance of 35 feet on the vein. At a distance of 16 feet in from the portal a sample was taken across 18 inches of the quartz vein which assayed: Gold, 5.12 oz. to the ton; silver, 1.2 oz. to the ton. At the face of the tunnel a sample taken across 8 inches assayed: Gold, 0.30 oz. to the ton; silver, 0.1 oz. to the ton.

The No. 2 tunnel is stuated about 200 feet vertically below the No. 1 tunnel and has been driven in for a distance of 110 feet on the vein. This tunnel would have to be driven for a further 400 feet to be vertically below the good ore in the No. 1 tunnel. At a distance of 30 feet in from the portal of this No. 2 tunnel a sample taken across a width of 14 inches assayed: Gold, 1.60 oz. to the ton; silver, 0.2 oz. to the ton; and a sample taken across a width of 2 feet on the hanging-wall side of the quartz vein at the face, which is here 3.6 feet wide, assayed: Gold, 0.90 oz. to the ton; silver, 0.2 oz. to the ton. A sample taken across 2 feet of a decomposed seam in a 60-foot tunnel paralleling the No. 1 tunnel on the hanging-wall side assayed: Gold, 0.32 oz. to the ton; silver, 0.08 oz. to the ton. Fine gold can be detected with a glass, freely scattered on slickensided surfaces, and it would appear that "the strongly altered and schistose" character of the diorite is a local condition of the mineralization. It is perhaps hardly to be

* McCann, W. S.: Geo. Sur. Can. Memoir 130, Bridge River Map Area.

expected under these conditions that there should be the same degree of uniformity and persistence in the vein formation as is the case with the *Pioneer* ore-body, but the evidence to hand is favourable to the assumption of a series of quartz-lenses included within a definite sheeted zone over considerable distances both horizontally and vertically; and while the assay results mentioned above are probably not average, the occurrence of such values is encouraging to further work, which should be devoted to development along the main ore-zone rather than to the prospecting of the several parallel sheeted zones that occur in association with it.

*Note on Bridge River Gold Camp.*

Although as pointed out by W. S. McCann and others, the gold-quartz veins of this area are related to the body of the augite-diorite stock and discoveries of economic ore have up to the present time been confined within its boundaries, a considerable amount of prospecting has been carried out in the adjacent belts of rocks of the Bridge River and Cadwallader series. In this relation mention is to be made of the work of J. Grull on the *Gold King* group, situated on the right bank of Hurley creek and lying to the north-west of the *Lorne*. On this property over 1,000 feet of underground workings has been completed by the owner, almost single-handed.

*Cinnabar.*

**Marion and Tyaughton.**

These groups of claims cover deposits of cinnabar in the Bridge River area. In the earliest records of mining in this area reports are included of the discovery of cinnabar float and of native amalgam, and more recently cinnabar has been found in place at two points north of the Bridge River valley. During the past year some prospecting-work has been carried out under the direction of C. E. Cartwright, of Vancouver, who made an examination of the properties. The *Marion* group is situated at a distance of about 5½ miles due north of the *Wayside*, at the headwaters of a small creek tributary to Pearson creek and at an elevation of between 5,500 and 6,250 feet above sea-level.

The *Tyaughton* group is situated on both sides of Tyaughton creek, immediately above the confluence of Liza creek, at an elevation of approximately 3,000 feet above sea-level.

In both cases the cinnabar is found in shales of the Bridge River series. On the *Marion* it is reported that stringers from ¼ to 2 inches wide of high-grade cinnabar have been found over a distance of more than 1,000 feet in the bed of the creek, and that at one point these stringers are sufficiently large and numerous to warrant the hope of discovery of a workable deposit; up to the present time, however, it has not been possible to do the necessary prospecting-work and no commercial ore can be said to have been proved up. The surface is covered with a heavy overburden. The further prospecting of this deposit is to be resumed as soon as the snow is off the ground.

On the *Tyaughton* more favourable conditions exist, a slide having removed the overburden to a height of about 400 feet above the creek-level, exposing an outcrop about 10 feet wide. Rough sampling of this exposure is said to indicate a content of around 1.6 per cent. mercury, but very little work has been done to permit of systematic sampling and at the present time no estimate of average value can be attempted. In further smaller outcrops small specimens of crystalline cinnabar are to be found. It is understood that plans have been completed for attacking the development of this prospect early in 1928.

PEMBERTON AREA.

**Copper Bear.**

This group covers the ground previously staked under the name of the *Eagle* group. The property was examined some years ago by the late W. L. Uglow and more recently was investigated by C. E. Cairnes, whose report appears in the Summary Report of the Geological Survey for 1924, Part A. An option was taken on the property during the past year by the Britannia Mining and Smelting Company, following detailed examinations made by members of the company's staff. The ore-deposits, which are being investigated as a source of copper ore, occur on the steep hillside 700 feet above Lillooet lake on its southern shore and at a distance of about 7 miles from the station of Pemberton on the Pacific Great Eastern Railway. In addition to some massive bodies of magnetite with a small copper content, there are a number of exposures of copper ore occurring as replacements and having a general direction paralleling the contact of a series of tuffs and agglomerates and interbedded bands of limestone with a body of granitic rock.

The principal concentration appears to be in the limestone and also to be related to a system of north-east, south-west fracturing. It is not clear whether the limestone, with which the several outcrops of ore are identified, occurs as a continuous belt or as a succession of smaller lenses; on the one hand, the general conformity to the north-west, south-east direction of the ore-exposures and the dominant influence of the fracturing upon concentration may be looked upon, in a positive and negative sense respectively, as being in favour of a continuous belt, while, on the other hand, the absence of positive proof of continuity and the lenticular appearance of the ore-bodies where exposed uphold the conception of a series of limestone inclusions following along the same general line. A 100-foot tunnel which was driven some years ago intersected one of these lenses of ore, having a steep dip northward towards the granite-contact and at a point where the foot-wall was represented by more or less unaltered limestone. Drifting in both directions upon this ore-body is being carried out by the Britannia Mining and Smelting Company as a measure of preliminary prospecting with a view to obtaining some more information in regard to continuity at this particular point; it is understood that a programme of diamond-drilling is to be commenced at an early date in order to investigate the more important possibilities of ore occurrence at depth. The following remarks upon this property by the company's engineer are published through the courtesy of the Britannia Mining and Smelting Company, Limited:—

"I would say that the mineralization was influenced to a large extent by a system of cross-fracturing and that the ore favours the limestone but is not confined to it. The ore occurs also in the volcanic tuffs but does not appear to be of as high a grade in the latter case.

"The principal pre-batholithic rocks consist of a stratified series of tuffs, limestones, and agglomerates. The tuffs are dense, hard, greenish-grey to black rocks which are not very strongly bedded. They contain crystals of pyrite which, on weathering, give them a rusty-brown colour, and also magnetite with some chalcopyrite as replacement deposits. The limestone occurs as lenses within the tuffs and varies in thickness from a few feet to 50 feet. Economically limestone is the more important as it contains deposits of larger size and higher content of copper. In places it has been altered to a mixture of garnet and epidote. The agglomerates consist mainly of fragments of andesite and andesitic matrix. It occurs usually at the base of the section and was not noticed to contain any ore-deposits.

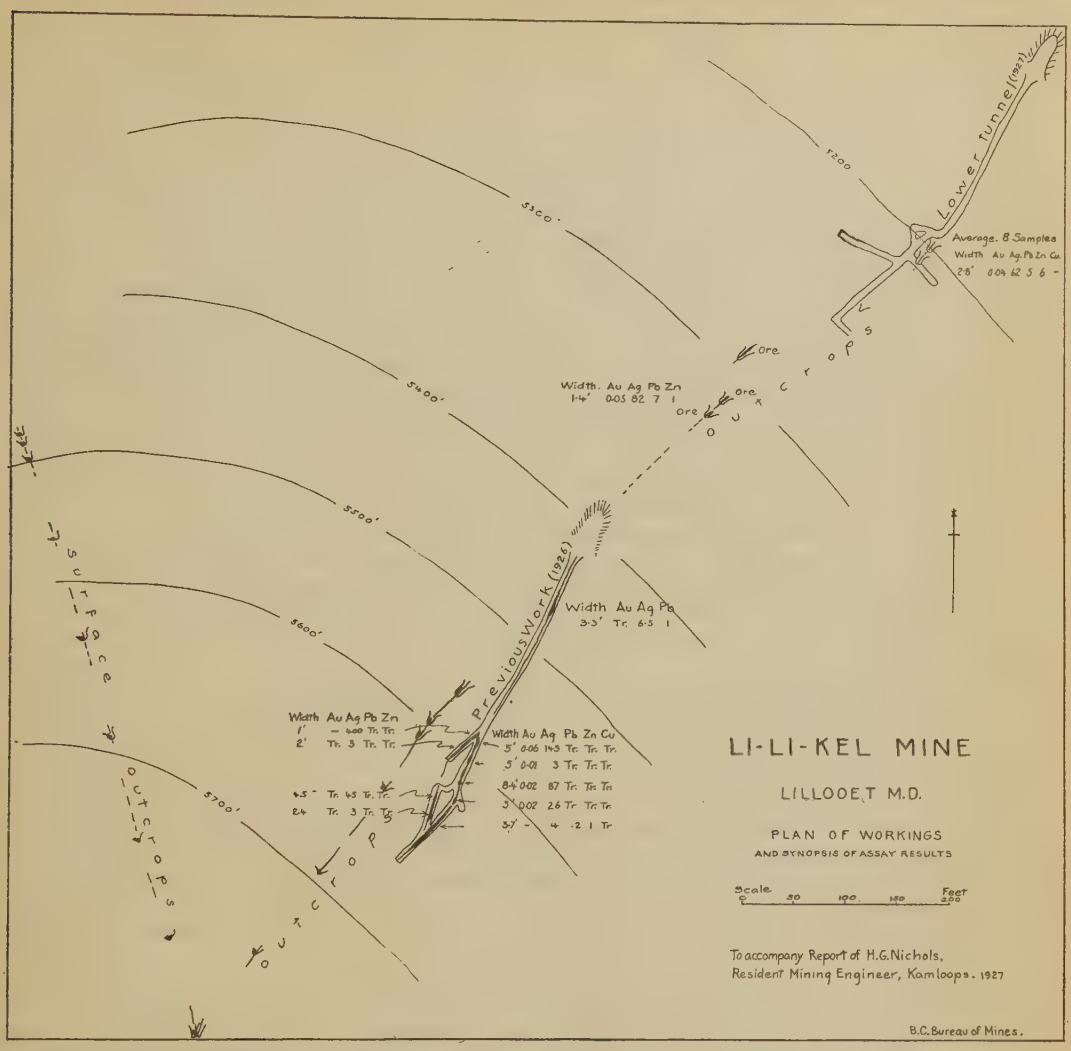
"The mineralization takes the form of replacement of the crystalline limestone and tuffs by an intimate mixture of pyrite, magnetite, and chalcopyrite in a gangue of silicified limestone, epidote, and garnet. The mineralization apparently occurs in lenses, although it is not certain that this is the case. From the work that has been done it would appear that intersections of the cross-fractures with the limestone-beds will afford probable concentration. At such intersections large ore-bodies may be found.

"This company has a working option of the *Copper Bear* group and has taken up some additional ground adjacent thereto. The work that has been done has consisted of driving on the vein both ways from the adit which was driven by the owner some ten years ago. We have also done some stripping on the surface and this, together with the underground work, has indicated continuity of the ore-deposit. The drifting underground has shown the limestone foot-wall to be irregular and of a changing direction, and from the position of the foot-wall at certain points relative to ore exposed on the surface would indicate a widening of the ore-body. However, no crosscutting has been done to determine the width at any point other than in the original adit."

There are twelve claims included in this group. The original claims stand in the name of T. Charleton and associates, of Pemberton.

**Li-li-kel.** A considerable amount of additional work was carried out upon this property by the Federal Mining and Smelting Company under T. B. Lewis. This included a further 400 feet of drifting in the tunnel that was driven last year and approximately 300 feet of drifting on a lower level about 300 feet below, together with about 60 feet of crosscutting. An average of twelve men was employed during the season.

The work on the lower level failed to prove up the ore indicated in the outcrops, but, on the other hand, surface prospecting higher up on the hill towards the south-west is said to have afforded encouraging results. Although some exceptionally high-grade silver ore occurs on this property, no tonnage of commercial ore has been proved up to the present time. It is




understood that a detailed geological investigation and survey of the whole property is to be undertaken before further development is put in hand next year.

**Gold King.** Work upon this property has been limited to assessment-work carried out by C. Barbour. This work was applied in carrying down the open-cut working where gold values were reported to have been found in the 1926 Annual Report. A further depth of from 5 to 6 feet has been exposed on the ore-body, with the result that some good ore has been uncovered, a picked sample of which assayed: Gold, 0.2 oz. to the ton; silver, 55.5 oz. to the ton; copper, 1 per cent.; lead, 8 per cent.; zinc, 1 per cent.

It is unfortunate that the projected plans for the development of this property did not mature during the past season, but it is understood that there is every likelihood that the work will be undertaken during the coming year. As pointed out in the 1926 Annual Report, the indications of better values coming in below the heavy iron-capping on the *Gold King* shear-zone are held to afford distinct encouragement for investigating the possibilities of this mineral-zone in depth.

*Eva.*—Work was continued on this property by George Moffat, and another lens of copper ore has been found on the other side of the quartz-porphyry dyke which is associated with the mineral-zone passing through the property.

*Silver Bell.*—Assessment-work on this property was carried out by T. Charleton and associates.

PLACER GOLD.

*Cayoosh Creek.*—The work of cutting a diversion-channel for the creek was carried out during the past year by the Enterprise Mining Partnership under the superintendence of A. J. McPherson. It was anticipated that the cutting of this channel might afford useful information in regard to the value of the ground in the basin of Cayoosh creek above the falls which forms the area upon which the proposed hydraulicking operations are to be carried on. About 7,000 cubic yards were excavated in cutting a length of about 800 feet of this channel, and the results of the operations are described in the following statement by A. J. McPherson:—

"We uncovered an old flume for a distance of about 250 feet, went through a bank of clay overlaid with boulders for another 100 feet, then through a sand-bank overlaid with boulders and gravel for 350 feet, and 100 feet through gravelly clay overlaid with about 7 or 8 feet of boulders and gravel. All this clay appears to me to be slide from the hillside to the south. None of the clay or the sand we went through contains any gold. The boulders and gravel on the surface contain small particles of flake gold everywhere, the richest being found on top of the clay surfaces. We recovered small amounts of gold all the way along. We did not expect very much returns from this work, but results did not come up nearly to our expectations and are not worth talking about."

**B.C. Alluvials, Ltd.**

Operations at Horseshoe bend on Bridge river have been suspended, following the failure to encounter any large amounts of pay-gravel in the bed of the stream. It is understood that a detailed examination and testing of the whole ground, including the bench areas flanking the river, is to be undertaken in the early spring, or as soon as weather conditions permit, and that the work is to be carried out by a competent Californian engineer.

The following notes relating to the recent operations have been supplied by Cooper Drabble, the company's engineer:—

"Work was confined to operations on the inner channel of the river at the upper or west end of the Horseshoe bend, where it debouches from the canyon and swings abruptly around an angle of 100° as it enters the bend.

"A temporary log crib-dam had previously been built down the bar here for a length of about 500 feet and the head of the inner channel was dammed by means of a rock and clay fill, connecting the upper end of the crib-dam with the left bank of the river at the end of the canyon.

"This work was successfully completed early in March and the river diverted down the outer channel, thus leaving about 800 feet of the inner channel available for mining to bed-rock.

"The seepage-water from the dam amounted to 8 c.f.s., which was collected and piped into the sluice-box, built down the side of the channel to dump into the overflow of the main diversion-cut below.

"The depth of the river-bed gravel averaged about 8 feet to bed-rock, the gravels containing numerous large boulders ranging up to 20 and 30 tons in weight.

"The boulders were first cleared from a length of 250 feet of the channel by means of a steam-derrick after the larger ones had been broken by dynamite, and the gravels were then shovelled into the sluice-box.

"The serpentine bed-rock was cleaned up dry and then picked over for a depth of 12 to 18 inches to ensure the recovery of all values.

"Operations were much handicapped by the accumulation of ice in the channels due to the prolonged winter and also by the small crew employed.

"Only occasional small patches of the original pay-dirt were found, and it soon became evident that the portion of the river-bed exposed by these operations had been previously worked, probably by means of an extensive wing-dam.

"These isolated patches of pay-dirt occurred under groups of large boulders which apparently prevented the original miners from entirely cleaning up the bed-rock, although it was evident that attempts had been made to tunnel under them.

"About 26 oz. of heavy coarse gold, showing little signs of wear, were recovered from these operations, when the work was suspended owing to the shortage of funds necessary to continue through these old workings and explore the ground ahead.

"A scheme of reorganization of the company to provide adequate funds for future operations is now under consideration by the directors, and it is understood that work will be resumed in 1928 on a scale more commensurate with the magnitude of the property."

# SOUTHERN MINERAL SURVEY DISTRICT (No. 4).

By Philip B. Freeland, Resident Mining Engineer.

## INTRODUCTORY.

The Southern Mineral Survey District (No. 4), comprising four Mining Divisions—Grand Forks, Greenwood, Osoyoos, and Similkameen—is situated in the extreme south centre of the Province of British Columbia, and is bounded on the south by the International boundary-line, on the east by the height of land controlling western-flowing streams, on the north by the watershed of southern-flowing streams, and on the west by waters flowing east from the Coquihalla range of mountains.

Tonnage production figures show a decided increase over 1927, which is again due chiefly to the Granby Company's operations. The low price of copper during the greater part of the year acted as a deterrent to prospecting for that mineral and worked a hardship on producing properties; the same thing applied to the lead and zinc producers. This depression in the metal market did not hinder prospecting in general and a greater interest was shown both by the town and village inhabitants as well as the men in the field.

In the Grand Forks Mining Division the chief feature of interest was the bonding of the *Union* and *Maple Leaf* groups to the Hecla Mining Company, of Idaho. For many years these semi-developed low-grade mines have lain idle for the want of sufficient capital to exploit them. A deal has been consummated on the *Union* whereby all payments will be made from income derived from ore or valuable metals shipped. This method of payment has become a custom only in the past few years where low-grade insufficiently developed properties are to be considered. It works out advantageously to both the purchaser, who has only the development costs to consider, plus, if warranted, the expense of mill-construction, and to the vendor, who has his property developed, anyway, free of cost and is paid the full purchase price out of earnings if the mine is a good one. This plan can, of course, only be practised when the purchaser has adequate capital.

A good deal of exploration has been carried on in this Division on some of the older prospects, with gratifying results in some localities. Geological conditions and transportation are particularly good in this Division.

### Greenwood Mining Division.

In this Division the mines on Wallace mountain continued to be the main attraction. The persistency of the ore and silver values at depth has been most encouraging. Numerous old mines and undeveloped prospects have received attention at Greenwood and there seems to be some likelihood of shipments being made next year.

### Osoyoos Mining Division.

In this Division the Hedley Gold Mining Company, besides operating the *Nickel Plate* mine, did a considerable amount of prospecting on claims adjacent to its property having the same class of ore, in hopes of finding high-grade material that could be treated in the mill and mixed with the low-grade tonnage in the deeper levels in the mine. Although this was not accomplished, there are still prospects worthy of further development in that vicinity, especially in the Apex basin.

### Similkameen Mining Division.

The large amount of money circulated bi-monthly by payment of wages to about 470 employees of the Granby Company at Copper mountain and Allenby, and the generous attitude by the Princeton citizens towards those intending to operate, was directly responsible for increased activity in this Division during the year. Several new discoveries were made in the Tulameen River area and many letters of inquiry have been received from interested capital and prospectors.

Actual results from large placer-mining operations have been delayed owing to insufficient capital accumulated before projects are exploited. In 1928 a tangible idea of placer prospects

should be forthcoming. Whether the values found in gold below water-level can be profitably handled by electric shovels remains to be proved. A long-boomed machine floated on a pontoon would go a long way towards solving this difficulty.

A list of the more important geological survey and other reports on the district is appended.

### List of Reports on District.

In the following table a list of the more important reports on parts of this district is given:—

| Name of Author. | Publication. | Description. | Year. | Page. |
|---|---|---|---|---|
| R. W. Brock | Geological Survey of Canada | Boundary District | 1901 | 49A |
| R. W. Brock | Geological Survey of Canada | Boundary District | 1902–3 | 92A |
| R. A. A. Johnston | Geological Survey of Canada | Aspen Grove | 1904 | 74A |
| Chas. Camsell | Geological Survey of Canada | Princeton | 1907 | ..... |
| Chas. Camsell | Geological Survey of Canada | Hedley | 1910 | ..... |
| Chas. Camsell | Geological Survey of Canada | Summary Report | 1912 | 211 |
| O. E. LeRoy | Geological Survey of Canada | Phoenix | 1912 | ..... |
| R. A. Daly | Geological Survey of Canada | 49th Parallel | 1912 | 2 vols. |
| O. E. LeRoy | Geological Survey of Canada | Mother Lode | 1913 | ..... |
| J. D. Galloway | Minister of Mines' Report | ..... | 1913 | 140–171 |
| J. D. Galloway | Minister of Mines' Report | ..... | 1914 | 336–357 |
| Leopold Reinecke | Geological Survey of Canada | Beaverdell | 1915 | ..... |
| D. B. Dowling | Geological Survey of Canada | Coal | 1915 | 255–261 |
| C. W. Drysdale | Geological Survey of Canada | Franklin Camp | 1915 | ..... |
| J. D. Galloway | Minister of Mines' Report | ..... | 1915 | 182–202 |
| W. M. Brewer | Minister of Mines' Report | ..... | 1915 | 205 |
| W. M. Brewer | Minister of Mines' Report | ..... | 1915 | 235 |
| Munition Resources Com., Mines Branch, Ottawa | ..... | Platinum | 1920 | 134, 147 |
| C. E. Cairnes | Geological Survey of Canada | Summary Report, Part A | 1922 | 88 |
| Eugene Poitevin | Geological Survey of Canada | Summary Report, Part A | 1923 | 84 |
| C. E. Cairnes | Geological Survey of Canada | Summary Report, Part A | 1923 | 46 |
| | Minister of Mines' Report | Annual Reports | 1917–27 | ..... |

Topographical maps covering part of the district can be obtained from the Surveyor-General, Parliament Buildings, Victoria, B.C. A list of these follows: Nos. 8 T 277, 3 T 277, 3 T 220, 7 T 263, 25 L 21, and Princeton-Tulameen area not numbered, all by G. J. Jackson; Nos. 21 L 21, 7 L 1, 2 T 128, 1 T 241, 22 L 21, and Brookmere-Summers Creek area not numbered, all by R. D. McCaw. These maps will be found very useful to any one prospecting the areas included.

### Transportation Features.

The main roads and trails were described in the 1926 Annual Report. In addition to these, the Kettle Valley Railway traverses the district between Farron, Grand Forks, Penticton, Summerland, Princeton, and Brookmere, with branch lines running from Grand Forks to Archibald, about 20 miles up the Granby river, and from Penticton to Oliver, about 22 miles down the Okanagan river. The old trails traversing the Pasayten river from its junction with the Similkameen river (Roche) to the International boundary-line and the trail up Chuwanten creek from its confluence with the Similkameen have been cut out by the Forestry Department. It is possible to take horses over the trail at the present time between Cambie Creek bridge, at the junction of the Little Muddy creek and the Similkameen river (Cambie), and the Hope trail via the Nicomen Ridge trail. The trail is rough and there is a good deal of fallen timber and it is necessary to pack a good axe. It is probable that the trail will be cut out, regraded, and relocated along the north side of the river in 1928. Another old trail between the South fork of Granite creek and the Hope trail will probably be cut out. Another trail has been started up Thynne creek from the Otter Creek road near Tulameen by the Forestry Department. The trail running from the Lawless Creek road to the *Independence* group on the Coquihalla has been cut out.

Special saddle- and pack-horse outfits can be obtained from Geo. Allison & Co. at Princeton. This syndicate caters to this class of work and knows the country thoroughly.

PROSPECTING.

A repetition of the likely country for prospecting which was incorporated in the 1926 Annual Report is appended.

*Grand Forks Mining Division.*—In the Paulson section gold, silver, and lead are found with occurrences of platinum associated with pyrite in the Burnt basin. This is an old mining district, but is worthy of more intense prospecting and perhaps closer examination of some of the semi-developed mines.

In the Cascade area the dunite rocks contain chromite which has been only partially developed.

In the vicinity of the Granby river (North fork of Kettle river) there are several prospects of silver, lead, zinc, and copper, whilst at Franklin camp the gold and copper ores command attention, especially in the pyroxenite rocks, which contain a good percentage of platinum where the copper sulphides are massive.

At the headwaters of the Granby river, named Lightning Peak camp, the silver-lead deposits are worthy of development.

A belt of serpentinized dunite rocks occurs at intervals between Grand Forks and Phoenix, and a certain amount of platinum is associated with the copper ores found near the contact of these rocks and the sedimentaries.

*Greenwood Mining Division.*—Further intensive prospecting and development of some of the old silver-lead mines near Greenwood is warranted, as well as a closer study of the copper occurrences at Copper camp beyond Deadwood.

Between Rock creek and Bridesville there are silver-lead deposits which have merit, and if the market price justifies it the chromite prospects in the same belt might be developed successfully.

The silver-lead deposits on Wallace mountain at Beaverdell need no advertising.

The country north and east, lying between the Kettle river and Westkettle river, is worthy of closer study, especially along the contacts of the quartz monzonite and in the quartz diorite; also the gold-bearing arsenopyrite on Horseshoe mountain.

*Osoyoos Mining Division.*—The belt of schistose rocks predominating north of Osoyoos lake and between the Okanagan and Similkameen rivers contains many gold-bearing quartz veins which might be prospected.

The whole section of country lying within the curve of the Similkameen river between Princeton and Similkameen Station and north of the International boundary has not been thoroughly prospected. The geology of the part of the country reported upon by R. A. Daly in his 49th parallel survey is sufficiently interesting to be followed up by closer inspection, especially on the contacts of the sedimentaries and igneous rocks. Native arsenic, tungsten, and strontianite have been found in the vicinity of the Ashnola river, which drains this part of the country to the north.

*Similkameen Mining Division.*—A continuation of the last-named area extends west as far as the Coquihalla and has been reported upon in sections by C. E. Cairnes, of the Geological Survey of Canada, Summary Report, 1922, Part A. Prospects of coal, silver-lead, and zinc have been found east and south of the Similkameen and Pasayten rivers. The belt of pyroxenite and peridotite rocks extends from Olivine mountain on the Tulameen river in a south-easterly direction to the International boundary, and along the contact of these rocks in the weathered zones good prospects of platinum have been panned. Transportation facilities throughout the district are good and a great assistance to prospecting.

In addition to this, the demand for chromite is greater and the dunite rocks mentioned are especially attractive for finding this mineral. Undeveloped prospects of chromite occur about 3 miles north of Rock Creek village on the Westbridge road. Prices of this mineral are quoted at $22.50 a long ton for 45 to 50 per cent. $Cr_2O_3$. In the area adjacent to the Similkameen river, Whipsaw creek, and especially near the junction of the Similkameen and Pasayton rivers, the schistose rocks are worth investigating for their copper, lead, zinc, and gold contents. On the falls of Coldwater creek, flowing into the Similkameen (Cambie) river from the south about 6 miles from its source, the pyroxenite rocks invade the sedimentaries and are worth exploring.

### Road and Trail Construction.

Much assistance was given towards roads and trails by the Provincial Department of Mines to operating companies, syndicates, and prospectors, providing the prospect of future development warranted it. Further requests were received from operating mines and others to keep the snow ploughed off the roads. A good deal of disagreement has arisen in this regard owing to the fact that those using sleighs for hauling require snow-covered roads to facilitate their work, whereas motor traffic demands the opposite.

The very heavy fall of snow in the early winter completely blocked all the roads. The ordinary "V" snow-plough used is not suitable for narrow mountain roads, because the inside wing of the plough throws the snow into the bank and ultimately traffic has to travel too near the outside edge of the road for safety. A plough of the road-grader type that is reversible will answer the purpose.

Many thanks are due to all mine operators and prospectors whose claims were visited, for their kindness and hospitality.

### Production.

The following table shows the production of No. 4 District:—

| Division. | Ore. | Gold. | Silver. | Copper. | Lead. |
|---|---|---|---|---|---|
| | Tons. | Oz. | Oz. | Lb. | Lb. |
| Grand Forks | 59 | 1 | 491 | 907 | 24,500 |
| Greenwood | 3,080 | 114 | 520,814 | ..... | 265,996 |
| Osoyoos | 44,910 | 12,851 | 111 | ..... | ..... |
| Similkameen | 757,675 | 4,031 | 137,971 | 17,725,294 | 7,163 |
| Totals, 1927 | 805,724 | 16,997 | 659,387 | 17,726,201 | 297,659 |
| Totals, 1926 | 722,741 | 20,454 | 561,167 | 17,787,595 | 187,093 |

| Division. | Zinc. | Arsenic. | Coal. | Limestone. | |
|---|---|---|---|---|---|
| | Lb. | Tons. | Tons. (2,240 lb.). | Tons. | |
| Grand Forks | 4,502 | ..... | ..... | 34,662 | ..... |
| Greenwood | 68,059 | ..... | ..... | ..... | ..... |
| Osoyoos | ..... | 666 | 576 | 167 | ..... |
| Similkameen | 6,567 | ..... | 169,771 | ..... | ..... |
| Totals, 1927 | 79,128 | 666 | 170,347 | 34,829 | ..... |
| Totals, 1926 | 6,864 | 509 | 135,922 | 34,916 | ..... |

## GRAND FORKS MINING DIVISION.

### Franklin Camp.

Since Franklin camp has become the centre of activity in this Division, due to the bonding of the *Union* and *Maple Leaf* mines, a résumé of developments and of some of the more important ore-deposits may be of interest to those who contemplate visiting the camp in 1928. In 1911 C. W. Drysdale, late of the Geological Survey of Canada, reported upon this area in his Memoir 56. The general, structural, and economic geology are ably dealt with in this memoir and do not require repetition here. Copies of this report can be obtained from the Geological Survey of Canada, Ottawa, or the British Columbia Branch, Winch Building, Vancouver, B.C.

Since 1911 a considerable amount of development-work has been done on the surface and some low-grade but interesting mineralization uncovered. A belt of rocks, called shonkinite-pyroxenite by Drysdale, forms one of the most interesting geological features, as they not only carry platinum, but the copper ores in the contact-rocks also carry this metal. Samples of nearly pure chalcopyrite from the upper workings of the *Maple Leaf* mine assayed as high as 0.45 oz. in platinum to the ton. Average values will not run nearly as high, but may prove sufficiently valuable to create a profit on a large low-grade operation.

The *Union* mine, which is the centre of attraction, has been developed at some depth in the greenstones. The mineral-deposits on the *Maple Leaf*, *Glouster*, *Banner*, and other claims also

occur in this rock. At the south end of the camp segregations of chalcopyrite have been found in the limestones. Still farther south and west, on claims owned by E. Rice and H. Hansen, segregations of copper sulphides have been discovered in the pyroxenite. Up to this time, in spite of the fact that platinum has been found, little or no placer-mining has been done. This metal had not been discovered when the geological survey was made, and it has not been definitely ascertained in what form the platinum occurs.

Transportation into the camp consists of a railway from Grand Forks for a distance of 20 miles and from there a motor-road for 25 miles. There are numerous trails leading from the road to the different claims. An ample supply of water is available from the Granby river throughout the entire year and sufficient for small operations can be obtained from Glouster and Franklin creeks. The development of the *Union* mine by the Hecla Mining Company will probably revive an interest in the camp to such an extent that owners of claims will clean out their workings and continue exploration in hopes of uncovering other deposits of mineral that may be attractive to this company or visiting engineers representing outside capital.

**Union Mining and Milling Co.** This company, formed some years ago with the intention of developing the *Union, Idaho, Union Fraction,* and *Paper Dollar* claims in Franklin camp, is controlled by the owners, Louis Johnson, Pat Maginnis, and the McDonnell Estate. A bond for $175,000 was taken on this group by the Hecla Mining Company, of Wallace, Idaho, late in the autumn of 1927. The agreement provides for a continuous programme of development and that all payments will be made out of ore or metal shipped. In November a No. 72 compressor, gas-engine, and other supplies were shipped and a gang of men sent in to repair the old camp buildings. P. H. Schulz is in charge and, it is understood, two levels will be driven ahead during the winter.

During the years 1913 to 1920 a total of 3,612 dry tons of gold and silver ore, valued at $121,677, was shipped from the *Union* mine to the smelters. Operation, transportation, development, and smelting charges consumed most of this revenue. The mine as it stands to-day appears to have an excellent chance of becoming a producing one.

The ore-minerals are chiefly pyrite, with small segregations of galena, and possibly a silver sulphide in a gangue of quartz and disintegrated greenstone. This ore can probably be easily concentrated by oil-flotation or cyanided. It is unlikely that a concentration plant will be thought of until more development-work has been done. Due to transportation problems, extraction of the values by cyanide may prove to be the most economical. Development-work done by the owners to date is shown on a plan of the workings in the Annual Report for 1920.

**Maple Leaf.** This group, consisting of the *Maple Leaf, Climax, Beaver, Witte,* and *Extension* claims and which adjoins the *Union* group to the north, has also been bonded by the Hecla Mining Company for $10,000. The ore-deposits found on this claim contain copper minerals and apparently have no relation to the gold and silver vein developed on the *Union.* Lenses of chalcopyrite were found near the greenstone, augite syenite, and pyroxenite, carrying variable quantities of platinum. Two car-loads of this ore was shipped to the old Granby smelter at Grand Forks, but the platinum content was not paid for. Most of the work has been done on a lower tunnel, where a freshet stripped the greenstones and exposed native copper and copper carbonates. This tunnel passed through the mineral-zone and was continued into the barren country-rock. The width of this lower mineralized zone is about 25 feet, and it appears to have been displaced by the intrusion of a porphyry dyke which extends along its westerly contact.

**Copper No. 2.** This claim, situated about a mile north-east of old Franklin camp and across the Granby river, is owned by Pete Santure and Joe Gelenes, of Grand Forks. Mineralization, consisting of pyrite, chalcopyrite, and bornite, occurs in the granodiorite, altered limestone, and volcanic tuffs. No commercial ore-bodies have been discovered to date, but high-grade lenses of copper ore in the limestone and a low-grade general dissemination of chalcopyrite and bornite in the granodiorite seem to warrant further exploration along the contacts. To the north of this claim an intrusion of pyroxenite cuts the volcanic tuffs. Very little exploration has been carried on in this belt.

**Black Diamond.** This group of claims, mentioned in the Annual Report for 1926, is situated about 5 miles up Bluejoint creek and to the south-west of Franklin camp. The owners, Elmer Rice and Chas. Hansen, of Grand Forks, opened up several low-grade bodies of pyrite and chalcopyrite in the pyroxenite during the year.

Juditta and Restake.

These claims, owned by John Morrell, of Grand Forks, are situated about 19 miles up the Granby river from rail-head. Shallow shafts, open-cuts, and short tunnels constitute development-work done over a period of years. The country-rocks are chiefly volcanic tuffs and andesites, with remnants of limestone in contact with granite and granodiorite. Pyrite mineralization is general throughout the tuffs, with occasional segregations of pyrrhotite, galena, and sphalerite. Picked samples of galena and sphalerite assayed as high as $15 a ton in gold, silver, and lead. An average sample across any of the mineralized areas will not assay more than $3 to the ton in all metals. Further exploration-work along the contacts of the granodiorite is to be recommended.

Blue Joint Nos. 1 to 4.

These claims lie a short distance to the east across the Granby river from Bluejoint camp, approximately 37 miles north of Grand Forks. The owners, A. Fee, A. Scott, F. Scott, and P. A. Petersen, of Grand Forks, have uncovered a mineralized area about 1,000 feet long by trenching and open cuts. The ore-minerals are chiefly pyrite and sphalerite in a gangue of quartz. There has been no development at depth and until this is accomplished very little can be said about economic values.

Little Bertha.

Stockholders in this mine, situated about 12 miles north of Grand Forks, let a contract for driving the lower crosscut tunnel ahead 200 feet. It is hoped that this tunnel will either encounter a blind ore-body or intersect the downward extension of the quartz vein mined in the levels above.

*Fife Lime-quarries.*—These quarries, situated near Christina lake and owned by the Consolidated Mining and Smelting Company, continued shipments of raw limestone to the Trail smelter.

### Paulson Section.

Halifax.

This group of claims, consisting of the *Halifax*, *Jenny Lind*, *Golden Age*, *Havana*, and *Arlington*, is situated about 3½ miles south-west of Paulson, in the Burnt basin. The *Halifax* claim is Crown-granted and a controlling interest is held by A. Jordan, 803 Medical Art Building, Indianapolis, U.S. A three-year lease was taken on the *Halifax* by Geo. and Henry Jackson, of Paulson.

These claims have been located on the north side of the basin near the *Molly Gibson* mine. The rock formations are chiefly limestones, volcanic tuffs, and andesites, intruded by diorite and more recent alkali-syenite dykes. The mineralized area occurs entirely in the limestone and development shows that it extends for a length of at least 500 feet. The ore-minerals are galena, zinc-blende, and pyrite in a gangue of quartz in the upper zone and chalcopyrite and pyrite in the lower. An analysis of the galena ore is as follows: Gold, trace; silver, 10.8 oz. to the ton; lead, 17.8 per cent.; zinc, 20.5 per cent.; sulphur, 14.3 per cent.; silica, 14 per cent.; iron, 14 per cent; lime, 1.8 per cent. Development-work done consists of open-cuts and a tunnel 60 feet below the outcrop.

The limestone-beds strike generally north-west, dip about 50° to the north-east, and are considerably warped and fractured. This belt of limestone is worth prospecting.

Manitou.

This claim adjoins the *Halifax* on the east and is owned by Cooper Bros., of Trail. Development-work consists of shallow shafts, trenches, and open-cuts in the limestone. The ore found, consisting of sphalerite, galena, and pyrite in a siliceous gangue, occurs in veins and segregations. Owing to the broken nature of the ground, caused by the intrusion of offshoots from the main batholith, and recent porphyry dykes, the ore-bodies are difficult to follow.

*Enterprise.*—This claim, leased by Rossland interests, is situated about 4 miles north-east of Paulson. A shipment of 28 tons of ore containing galena, zinc-blende, chalcopyrite, and pyrite was made to the mill at Trail.

*Inland Mine.*—This old mine has not been worked for many years and the shafts are full of water, the open-cuts caved in, and the mill and buildings in a dilapidated condition. No examination is possible until the workings are cleaned out.

### Lightning Peak Camp.

This camp, situated on the dividing line between the Grand Forks and Greenwood Mining Divisions, will be dealt with under the one heading to avoid confusion. Last year a surveyed rawhide trail on a good grade was constructed by the Provincial Government. The idea of building this trail was to permit the small operators in the camp to ship out their high-grade

ore and transport supplies into the camp on return trips. Apparently the supplies were not rawhided in to any extent, and in the spring, when the winter road was unfit for sleighing, an attempt was made with pack-horses, which ended in the loss of some valuable foodstuff.

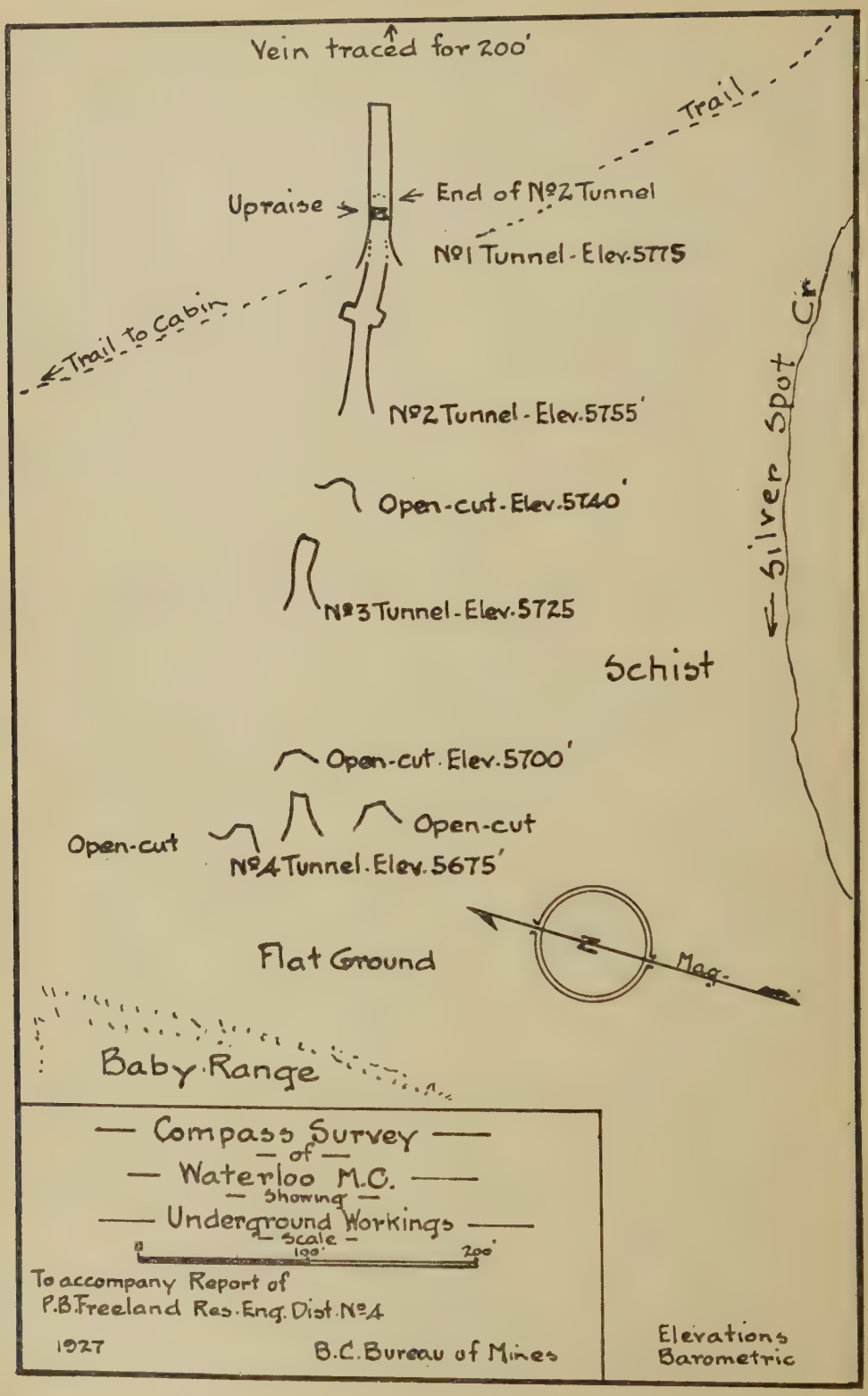
The rawhide trail follows open meadows which are swampy in the early summer months. Possibly, when developments warrant it, this trail can be ditched and culverts put in. At the present time the high trail up Sand creek will suffice for summer packing and the lower trail for winter hauling. On the *Lightning Peak* group of claims two or three men were working steadily on development, whilst on the remaining claims in the camp during the summer nothing but assessment-work was being done. It seems probable that the camp will develop some tonnage of medium-grade silver-lead ore which, when taken as a whole, may be sufficient to supply a concentrator. At the present time the *Waterloo* is one of the claims that has a good prospect of developing a large tonnage. The belt of schists, in which most of the silver-lead ore is found, extends nearly 4 miles around the toe of Lightning peak. Little or nothing is known about the centre part of this belt because it is buried deep in gravel and loam. At one end the *Killarney* and *Lightning Peak* group of claims are situated, and at the other the *Waterloo*, *Silver Spot*, and *Potosi* group. On the *Lumpy* claim, near the centre, small segregations and stringers of high-grade silver ore have been found, but no extensive exploration has been carried out.

**Killarney.** This claim, owned by W. J. Banting, of Edgewood, lies to the south-west of the *Lightning Peak* group and was reported upon in 1925. Since that time the lower crosscut tunnel has been driven a total distance of 115 feet and should have intersected the downward extension of the vein found above if the dip of 71° had been maintained. The vein has been stripped in the upper open-cut and followed downhill for 25 feet. A fault, dipping at about 25°, cuts off the ore above the open-cut and another fault of similar dip has displaced the vein 25 feet below. It seems likely that this series of step-faults continues down the hill to the mouth of the lower crosscut tunnel and that the root of the vein will be found in or on the north side of the creek. On the east side of the mouth of the tunnel a streak of gouge containing kaolin and disintegrated schist has been uncovered. This is probably another fault and exploration for the downward extension of the vein should be looked for below this. The ore contains values in silver and lead.

**Lightning Peak.** This group, consisting of the *Thunder Hill*, *First Chance*, *West Fork*, and *Jim Hill* claims, was again under lease to W. A. Calder, of Edgewood. Thirty-five tons of silver-lead ore was rawhided out and shipped to Trail during the winter. The present lowest underground workings have been driven over 300 feet in the schist along the general strike of the vein found in the upper levels, without any true walls being encountered. The whole mass of schist has been faulted and crushed to such an extent that it seems advisable to drive ahead on this strike and crosscut occasionally in hopes of finding remnants of the displaced vein. As far as can be seen, the rocks to the north-east are more in place and, if the vein is struck here, there is some prospect of finding minable ore in place. The ore found in the lower workings to date is not of a high enough grade to permit profitable shipping, but there is a prospect of blocking out a sufficiently large tonnage to warrant the consideration of a mill in conjunction with other properties in the camp. The ore consists of galena, sphalerite, and pyrite in a gangue of quartz. Occasional films of native silver are found in the fractures. The ore occurs in schist, a quarter of a mile south of the granodiorite-contact. Lamprophyre dykes cut the schist.

**Potosi Group.** This group, consisting of the *Potosi No. 1*, *No. 2*, and *No. 3* claims, and owned by James Graham and A. Scia, of Greenwood and Edgewood, is situated on what is locally known as the Baby range of hills to the west of the *Waterloo* claim. Several quartz veins from 2 to 6 feet wide have been traced on the surface for over 1,000 feet in a north-westerly direction. A picked sample of ore, containing pyrite, assayed 0.40 oz. in gold and 35 oz. in silver to the ton. The veins are persistent and wide and warrant further exploration. The general strike and character of these veins is similar to those of the *A.U.*, *Silver Spot No. 2*, and *I.X.L.* claims mentioned in the 1925 Annual Report.

**Waterloo.** This claim is owned by C. M. Kingston, of Grand Forks, and G. A. Rendell, of Trail. In 1917 632 lb. of high-grade silver-lead-zinc ore was sorted, sacked, and packed out to the end of the road on horses. This ore assayed: Gold, trace; silver, 521.5 oz. to the ton; lead, 12.5 per cent., zinc, 17.05 per cent. The ore-minerals were galena, sphalerite, argentite, proustite, pyrargyrite, and pyrite in a gangue of quartz and calcite. In 1918 938 lb.


Vein traced for 200'
Trail
Upraise
End of No2 Tunnel
No1 Tunnel - Elev. 5775
Trail to Cabin
No2 Tunnel - Elev. 5755'
Open-cut - Elev. 5740'
Silver Spot Cr.
No3 Tunnel - Elev. 5725
Schist
Open-cut Elev. 5700'
Open-cut
Open-cut
No4 Tunnel. Elev. 5675'
Flat Ground
Mag.
Baby Range
Compass Survey
of
Waterloo M.C.
Showing
Underground Workings
Scale
100'
200'
To accompany Report of
P.B. Freeland Res. Eng. Dist. No4
1927
B.C. Bureau of Mines
Elevations
Barometric

of similar ore was transported to the Trail smelter. This shipment assayed: Gold, 0.02 oz. to the ton; silver, 763.3 oz. to the ton; lead, 4 per cent.; zinc, 9.5 per cent. In 1919 19,818 lb. of ore was shipped, which assayed: Gold, trace; silver, 528.2 oz. to the ton; lead, 5.3 per cent.; zinc, 11 per cent. In the same year 5,424 lb. of ore was shipped, showing assay returns of: Gold, *nil;* silver, 293.4 oz. to the ton; lead, 4.7 per cent.; zinc, 7.6 per cent. In 1920 two other shipments were made of 28,920 lb. and 16,115 lb. of about the same class of ore. All this ore was hand-sorted and sacked before shipments were made. In November, 1926, what was considered to be an average sample of ore from the present workings, of 100 lb., was shipped to the Trail smelter for concentration test. The heads of this sample analysed as follows: Gold, trace; silver, 25 oz. to the ton; lead, 5.5 per cent.; zinc, 8.6 per cent.; iron, 4.1 per cent.; sulphur, 5 per cent.; silica, 36.2 per cent.; lime, 15.2 per cent. The ore is readily amenable to flotation. Some difficulty was encountered in obtaining a high silver extraction in the lead concentrate, but this can be partly overcome by the use of dibasic phosphate. The following is based on probable mill recoveries from the class of ore shipped. Lead concentrates assayed: Silver, 245.9 oz. to the ton; lead, 64.8 per cent.; sulphur, 13.9 per cent.; silica, 6.4 per cent.; lime, 7.8 per cent. The zinc concentrates assayed: Silver, 24.8 oz. to the ton; lead, 2.8 per cent.; zinc, 52.4 per cent. The ore shipped was taken from a shoot found between the No. 2 tunnel and the surface. The minerals galena, sphalerite, pyrargyrite, and native silver appear in isolated form, cemented together with siderite and calcite. Each mineral seems to be nearly pure of its kind. Development in the No. 2 tunnel and on the surface, at lower elevations, shows this condition to exist. The size of the vein below the upper tunnel cannot be definitely estimated until more crosscutting is done. Faults and minor slips have in some cases been mistaken for foot or hanging walls.

The ore-body has not been definitely proven in the lowest workings, but there is much oxidation with displaced segregations of galena and sphalerite to be seen in the open-cuts. It seems probable that the schists, in which the ore occurs and which is one of the oldest rocks, have been mineralized by the granite batholith which lies to the north-west. Later igneous intrusion, forming what is known as Lightning peak, again disturbed the area and caused a considerable amount of movement and consequent metamorphism. A compass and pace survey was made of the workings in August and a map is attached to this report. The elevations are barometric.

The floor of the upper tunnel is about 100 feet in elevation above the lowest workings and the distance between them is about 400 feet. This area is sufficiently well mineralized to warrant further development. There is enough water in the creeks to supply domestic needs and probably a sufficient quantity could be stored for a concentration plant from the springs above. Timber is plentiful. The barometric elevation of the upper tunnel is 5,775 feet. Snow is very plentiful in winter and offers a comparatively cheap means for hauling in supplies over the trail for initial development. The distance from the *Waterloo* mine by trail to the Edgewood–Vernon motor-road is about 20 miles. The distance from the junction of the trail and road to Edgewood is about 22 miles. From Edgewood by boat to West Robson and thence by rail to the smelter at Trail is 69.8 miles. All ore has to be sacked for shipment by boat. The cost of a rough wagon-road into the *Waterloo* has been estimated at $50,000 over the present survey. By taking a cut off and an adverse grade at Moore creek about $6,000 of this amount can be saved.

### Summit Camp.

B.C.

This mine is situated near Denoro, on the divide between the Grand Forks and Greenwood Mining Divisions. In 1898, 1899, 1900, and 1901 the B.C. Chartered Company, Limited, of Montreal, of which Chas. E. T. Porteous was vice-president, operated the property and shipped copper ore to the smelter. In 1913, 1914, 1916, and 1917 different leases were taken on the property and some ore shipped. At the present time A. N. Docksteader *et al.*, of Grand Forks, have leased the property and during the year an attempt to lower the water in the glory-hole was made, as well as cleaning out some of the old surface workings and prospecting the strike of the ore-bodies generally. Maps of the workings showing the diamond-drill holes up to 1901 are in the possession of the lessees and a very good idea of the strike, dip, and the character of the ore mined is obtainable.

At that time little was known about the geology of the Boundary area and the connection, if any, between the dykes and the ore-bodies was not solved. Later developments in other parts of the country in similar character of rocks point to the theory that the alkali-syenite

dykes do not influence the ore-deposition other than as a disturbing factor and to cause a slight pyritic mineralization along the contact.

In 1902 R. W. Brock, of the Geological Survey of Canada, reported in part as follows:—

"This mine possesses peculiarities which deserve noting. The ore-body occurs on a contact between white crystalline limestone and greenstone, too much altered to determine whether porphyritic or pyroclastic. In thin sections the porphyrite structure can be seen, but this might be a fragment, and north along the wagon-road to Eholt, a short distance from the mine, the tufaceous character of the rock is distinct. South, in the south-west corner of the basin in which the mine lies, the compact porphyrite occurs. Dykes of diorite porphyrite, somewhat the worse for wear, occur in these rocks, one just west of the dining-hall. The exact form and extent of the limestone-mass cannot be made out, partly owing to covering of drift and partly owing to the alteration which it has some time undergone.

"It appears to be a lenticular mass lying north and south in the greenstone, extending from about the railway spur north of the shaft-house to a point on the hillside 200 paces south of the south prospect-shaft.

"*Main Ore-body.*—A large mass of limestone occurs on the hill at the head of the basin and along the ridge between the B.C. and Rathmullen creeks. Towards the north end of this ridge are greenstone tuffs and conglomerates, extending westward across B.C. creek. These are capped by Tertiary lavas and sheets of alkali porphyry and are much cut up by dykes and intrusive sheets of the latter rock. The main ore-body of the B.C. is a lenticular mass, lying about north and south, with a slight easterly dip. It is 65 feet wide and about 200 feet long, but contracting along both dimensions as it goes downward. It is very much cut up by intrusive sheets of alkali porphyry which form regular floors in the lode. There are two sets of these sheets, one a coarser-grained reddish porphyry with biotite crystals in addition to numerous feldspar crystals, and a later, light-pinkish set, with no visible crystals except those of feldspar. Both sets have distinct salbands against the ore, but the ore does not appear to be affected by them, being continuous from one sheet to the next one below and so on down. It has, however, a platy jointing parallel to the sheets, along which the ore falls readily away. This plating may be due to heating by the dykes and subsequent contraction.

"*Depth of Mine.*—The ore is mined to 400 feet, below which the sheets become so heavy and numerous that it would not pay to extract the ore. Other ore-shoots on the lead are being tested by surface workings. Sufficient ore has already been taken out to have made the mine a success.

"Several diamond-drill holes have been run from the 400-foot level, one to a depth of 511 feet below. While a considerable amount of ore was gone through, even to the bottom of the hole, a large proportion of the core was of alkali porphyry. Toward the bottom of the hole a good deal of granodiorite was cut through, as though this rock occurred *en masse* at no great depth below.

"*Nature of Ore.*—The ore consists of chalcopyrite, pyrrhotite, and a little pyrite, with the following gangue minerals: Garnet, quartz, calcite, and magnesium carbonate, epidote, zoitite, actinolite, chlorite, serpentine, plagioclase, and probably kaolin.

"This gangue is in part at least altered greenstone, as the structure was retained in a microscope-slide. As the limestone, though rather sharply defined, shows some alteration and garnetization, it may form part of the gangue. Garnet is probably the most abundant gangue mineral.

"A little specular hæmatite and zinc-blende occur on the outskirts of this ore-body. The walls are merely 'commercial walls.'

"A fault parallel to the ore-body runs through porphyry and ore with no great vertical displacement.

"About 200 feet south of the shaft-house an open-cut shows a contact of the white crystalline limestone and the altered garnetiferous rock. The division between the two is sharply defined.

"The values are considerably above the average for the Boundary district, principally in copper. The average assay for the ore shipments to the end of 1901 is said to be: Copper, 5.8 per cent.: silver, 2.45 oz.; gold, 0.015 oz. per ton. The best values have been obtained when the ore-body is constricted."

The dykes, according to Brock, lie almost horizontal, cutting through the ore-bodies and intersecting them at right angles. Sections of the underground workings, made in 1899 by

J. C. Ralston, mining engineer, Spokane, Wash., down to the second level, show a different condition to exist down to that elevation; that is, the ore-bodies, lenticular in form, strike vertically between the unaltered limestone and the greenstone. The porphyry occurs in a mass to the north and east as narrow apophyses dipping about 45° to the west and as a laccolith to the south of the main shaft between the first and second levels.

About 300 feet to the south of the most southerly workings of the first level, a shaft, now filled with water and, judging by the size of the dump, about 50 feet deep, evidently struck ore. A sample from the dump assayed: Gold, 0.07 oz. to the ton; silver, 2.3 oz. to the ton; copper, 5.94 per cent. The 250-foot level was evidently driven under this and apparently there is no connection between the workings, because the water in the shaft does not decrease when the main northerly shaft is pumped. Diamond-drill holes were also bored laterally to the east and west from the 250-foot level, but no upright vertical holes were put in.

According to the map, the main shaft was sunk 409 feet from the surface. From this, levels were driven at 50, 150, 250, 325, and 409 feet. Most of this development-work has been done north, east, and west of the main shaft and only the 50- and 250-foot levels have been driven any distance to the south.

R. W. Brock mentions that ore was found to exist between the porphyry dykes below the 409-foot level and that ore was gone through even to the bottom of the hole, but he does not state the width of this ore or mention the fact that, because the ore-bodies are lenticular in shape, the drill-holes may have cut one corner or side of the body and that wider dimensions might be looked for.

Only two vertically down diamond-drill holes were bored about 100 feet east of the main shaft on the 409-foot level within 35 feet of each other, which could not test the size of the ore-deposits under the mineralized area. He also mentions the presence of granodiorite at a depth of 511 feet below the 409-foot level. This rock is generally accepted as having been responsible for the ore-deposition in deposits of this type in the Boundary area.

The old workings, including the glory-hole, are nearly full of water, but along the sides some fairly high-grade ore is obtainable. A sample of pyrite, pyrrhotite, magnetite, and chalcopyrite assayed: Gold, 0.04 oz. to the ton; silver, 0.80 oz. to the ton; copper, 2.38 per cent.

The bulk of the ore seems to have lain above the 250-foot level; hence the virgin country to the south above this elevation appears to contain the best possibilities.

A new open-cut has been driven by the lessees about 300 feet south of the main shaft. A sample of the ore discovered in this cut assayed: Gold, 0.05 oz. to the ton; silver, 0.80 oz. to the ton; copper, 1.62 per cent. Surface drilling will prospect this area.

All the ore mined was shipped to Greenwood for direct smelting. An analysis of this class of rock is as follows: Sulphur, 5.5 per cent.; silica, 27.5 per cent.; iron, 20.3 per cent.; lime, 24.2 per cent., plus copper and silver values.

It is possible that there may be bodies of ore too low grade to be shipped direct, but large enough to warrant concentration. There is a wagon-road and an old railway-grade into the property.

*Shipments from the B.C. Mine.*—1898, B.C. Chartered Company, Limited; 1907, B.C. Copper Company; Canada Copper Corporation; lease, J. St. Clair, 1919.

| Year. | Men below. | Men above. | Tons. | Gold. | Silver. | Copper. |
|---|---|---|---|---|---|---|
| | | | | Oz. | Oz. | Lb. |
| 1899 | .... | .... | ..... | ..... | ..... | ..... |
| 1900 | .... | .... | ..... | ..... | ..... | ..... |
| 1901 | 50 | 25 | 46,816 | 666 | 93,420 | 3,629,751 |
| 1902 | 15 | 15 | 14,500 | ..... | 21,000 | 1,000,000 |
| 1903 | 18 | 19 | 17,768 | ..... | 25,908 | 1,200,127 |
| 1904 | .... | .... | ..... | ..... | ..... | ..... |
| 1905 | .... | .... | ..... | ..... | ..... | ..... |
| 1906 | 8 | 4 | 1,488 | 13 | 1,411 | 68,412 |
| 1907 | 10 | 4 | 1,685 | 17 | 1,567 | 64,518 |
| 1916 | 6 | 5 | ..... | 1 | 674 | 35,703 |
| 1917 | 5 | 2 | 675 | ..... | 1,379 | 72,888 |
| 1918 | 10 | 6 | 861 | ..... | 200 | 10,000 |
| 1919 | 1 | 3 | 120 | ..... | ..... | ..... |
| Totals to 1927, inc. | .... | .... | 83,913 | 697 | 145,559 | 6,081,399 |

**Cordick.** This claim, situated in Summit camp near Denoro, is owned by M. Blumfontein. On the *Bell* claim, which adjoins the *Cordick* on the north-west, a tunnel has been driven for 235 feet to the boundary-line. This tunnel has been extended into the *Cordick* for 100 feet in a south-easterly direction on the vein. The face of the tunnel in June showed a general mineralization of pyrite and hæmatite in a quartz-calcite gangue across 4 feet of the vein. On the surface beyond the face, and at a rising elevation up to 100 feet above the tunnel-level in the greenstones, many open-cuts and trenches show copper carbonates in the fractures of the rocks. An intrusive mass of pulaskite porphyry about 100 feet wide cuts across the strike of this mineralization and need not be considered as ore-bearing. On the south-east side of this dyke the formations are in place and the continuation of the vein seems probable. Some fairly high-grade copper ore was mined in the *Bell* tunnels and shaft in the early days. No exact figures on these shipments are obtainable.

## GREENWOOD MINING DIVISION.

**Meadow View No. 2.** This group, consisting of the *Meadow View No. 2*, *Paladora*, and *Summerset* claims, and owned by A. H. Old, J. B. Old, and W. H. Page, of Edgewood and Needles, is situated 1 mile north-east of the Edgewood–Vernon motor-road and 30 miles from the former town, at an elevation of about 5,700 feet (barometric). The claims are Crown-granted and no work has been done upon them for many years. The reason for this is that until the motor-road was built two years ago there was no easy means of transportation. Development-work consists of a shaft 28 feet deep, and an open-cut 6½ by 5 feet on the *Meadow View*, close to the boundary line, and on the *Paladora* three shafts, 20 feet, 4 feet, and 15 feet deep respectively, besides numerous open-cuts on the vein. A crosscut tunnel (caved) was driven 50 feet below the upper working for 40 feet without cutting the vein. The total distance of vein-outcrop is about 1,500 feet, having an average width of about 3 feet, with occasional blow-outs 6 feet wide, and a strike of N. 82° E. (mag.) and a dip 70° N. 8° W. The ore-mineral is chiefly pyrite carrying gold, with occasional specks of galena and sphalerite in a gangue of quartz. Owing to the dilapidated condition of the shafts it was impossible either to see or sample the vein at any depth. A sample of sorted ore from the *Meadow View* shaft assayed: Gold, 1.54 oz. to the ton; silver, 8 oz. to the ton. A sample from a 6½-foot vein in an open-cut 70 feet east of this shaft assayed: Gold, 0.14 oz. to the ton; silver, 1 oz. to the ton. A sample 6 feet wide from the third shaft on the *Paladora* assayed: Gold, 0.32 oz. to the ton; silver, 1.6 oz. to the ton. A picked sample from 1 foot of this vein assayed: Gold, 2.44 oz. to the ton; silver, 11 oz. to the ton. The vein has been faulted up the hill between No. 2 and No. 4 shaft. Some of the assay returns are sufficiently encouraging to warrant cleaning out the workings so that a proper examination of the vein developed at depth can be made. These claims lie on the summit between the Greenwood and Arrow Lake Mining Divisions.

### Wallace Mountain Section.

Wallace mountain, Beaverdell, was described in detail in the 1926 Annual Report. No new discoveries of importance have been made during the year, but the older, well-developed claims have been operating steadily and their prospects for future output never looked better. In the deeper developments the high-grade silver minerals still continue, with the exception of pyrargyrite, which seems to have been replaced by tetrahedrite, carrying relatively high silver values. Close sorting of the ore has been found not to pay owing to the difficulty of separating ore from gangue and to the fact that the fractures of the gangue rock often contain slabs of argentite and native silver. The following mines operated continuously throughout the year: *Bell*, *Sally*, *Wellington*, and *Bounty*. Small shipments were also made from the *Gold Drop*, *Rambler Fraction*, *Revenge*, *Standard Fraction*, and *Tiger*. A total of about 3,000 tons has been shiped during 1927, representing a value of approximately $280,000.

**Beaver.** This claim, bonded by the Beaver Silver Mines, Limited, was fully reported upon in the 1926 Annual Report. During 1927 a programme of development was carried on with some encouraging results. The inclined shaft was deepened and a crosscut driven east, which, it is reported, struck the downward extension of the shear-zone mined above. The Sutherland tunnel was also driven ahead and strong indications of ore found in the fault-planes.

**Standard Fraction.** Penticton interests carried on development of this claim under lease and bond during the greater part of the year. Crosscuts were driven from underground and also from the surface in an endeavour to strike the root of the vein mined above, without success.

**Rambler Fraction.** A Penticton syndicate drove an upper tunnel 125 feet on a quartz vein which carried spasmodic high-grade values in silver. After the death of Homer Wells, one of the working partners, work ceased. This claim is owned by W. Rambo, of Beaverdell.

*Black Diamond.*—According to reports, a new strike was made on this claim by P. Kennedy, of Beaverdell. A visit was paid to the claim, but owing to the absence of the owner this find was not examined.

**Gold Drop.** This group, consisting of the *Gold Drop*, *Homestake*, *Alaska Fraction*, and *Gold Drop Fraction No. 2* claims, has been bonded by the Killarney Syndicate, of 716 Vancouver Block, Vancouver. The development previously done consists of an old shaft supposed to be 50 feet deep, a tunnel 100 feet lower in elevation and 260 feet in length, as well as open-cuts and trenches. About 5 tons of silver-lead-zinc ore was taken from a small stope in the tunnel. The shear-zone, which occurs in quartz diorite varying from 2 inches to 2 feet in width, has been badly crushed and faulted. In the face of the tunnel the ore is lean and narrow. In an open-cut to the north of the tunnel there appears to be a vein running parallel to the one found in the shaft above. According to the survey made, it is possible that the tunnel vein is the same as the one found in the open-cut, and not the shaft vein in which good ore is supposed to have occurred. The throw of the faults and the dip of the vein is to the south or to the right of the present tunnel. An extension of the crosscut, already commenced from near the face of this tunnel, should cut the shaft vein, providing it has maintained its dip.

**Bounty.** The ore shipped from this claim was taken from the stope between the lower crosscut tunnel and the open-cut and winze 100 feet above. A large block of ground still remains to be worked before another lift is taken. A. Stanhope, the owner of the claim, employed two men during the year.

**Wellington.** Operations on this claim by the Wellington Syndicate, of Greenwood, continued satisfactorily throughout the year. Development for 1927 amounted to drifting 80 feet and crosscutting 30 feet on No. 3 level; upraises between No. 2 and No. 3 levels, 150 feet; sinking from No. 3 to No. 4 level, 53 feet; drifting east on No. 4 level 100 feet and west 90 feet; upraising from No. 4 level to No. 3, 45 feet. A new tunnel 100 feet below No. 4 has been commenced and a 22- by 16-foot dry-house with hot and cold water and shower-baths for the men has been built.

The ore-shoot persists along the floor of No. 4 level and No. 5 is being driven under this ore. The usual complex faulting was encountered and in one case drag-ore was observed on both sides of a fault. The latest advice states that everything looks favourable for a successful year in 1928.

**Bell.** McIntosh & Lee operated this mine steadily throughout the year and an average number of twenty men was employed. Development-work consisted of approximately 100 feet a month of drifting, etc. The ore mined during the winter months is transported by sleigh to the railway at Beaverdell. The future of this mine appears to be bright.

**Sally Mines, Ltd.** Under the management of Ed. Nordman, operations on this group of claims continued satisfactorily during 1927. An average of about twenty-six men was employed. Development consisted of 1,628 feet of drifting, 1,405 feet of crosscutting, 532 feet of upraising, and 43 feet of sinking. All the ore shipped was taken from the *Rob Roy* and *Pueblo* claims. A considerable amount of work was done on the No. 2 vein on the *Sally* claim and new ore-bunkers were built. Prospects for 1928 are considered fair.

**Revenge.** This mine, situated below the *Bell* claim, was leased by the Crysler Mining Syndicate during 1926–27 and fully equipped with machinery. Owing to lack of funds work ceased, and during 1927 an unsuccessful attempt was made to refinance. With all the necessary outfit for immediate operation on hand, this property is worth investigating. Geo. Barrett, of Beaverdell, is the owner.

### Cranberry Ridge Section.

This ridge and some of the ore-deposits found upon it were described in the Annual Report for 1926. To the outsider, Beaverdell embraces the whole of the mining country adjacent to the town and the name denotes high-grade silver ore. Although the formations are the same—i.e., quartz diorite on both sides of the Westkettle river—and some of the ore-minerals are similar, it has been found that the Cranberry Ridge shear-zones have not, up to the present, carried the high silver values obtainable on Wallace mountain. Very little work has been done at depth to prove the quality of the Cranberry Ridge deposits, and until this is accomplished nothing definite can be said, except a warning to those about to become interested not to confuse the Wallace Mountain area with the other. Railway transportation follows the east side of Cranberry ridge and offers favourable facilities to any operations adjacent to it. The persistency and size of some of the mineral-outcrops warrant development, with the idea in mind of finding a large enough medium-grade deposit that will pay to concentrate.

**Laurion.** This claim, owned by G. Bongalis, Beaverdell, and situated on Cranberry ridge about 3 miles south of Beaverdell, has been leased and bonded by Spokane interests and a company called the West Kettle River Mining Company, Limited, formed. The officers of the company are W. E. Johnston and Henry Britzen, of Beaverdell, B.C.; R. C. Draggo, of Yakima, and Howard Denis, of Spokane, Wash. At the time of examination two highly oxidized stringers had been exposed in an open-cut. Specks of galena, zinc-blende, and pyrite were noticed in these stringers. Higher up the ridge segregations of solid pyrite, carrying low values in gold, had been uncovered. Since this examination and according to the owners, these stringers have widened out into 2½ feet of ore carrying galena and pyrite. It is the intention of the lessees to drive a lower tunnel to tap this showing about 200 feet lower in elevation. This main working-tunnel will be about 500 feet from the railway.

**Jo Dandy.** This claim is situated about a mile west of the Kettle Valley Railway, near Rhone Station, and is owned by Arthur Mellor, of Westbridge. Development-work consists of an old shaft supposed to be 35 feet deep, a crosscut tunnel 75 feet in length with an open-cut approaching it 48 feet long, and another tunnel 20 feet lower in elevation and about 30 feet in length. The rock in which this work has been done is a highly metamorphosed schist of unknown age. An intrusive porphyry dyke cuts this formation on the west flank about 100 feet from the shaft. As far as can be seen, the schists continue for half a mile to the east and for a mile north and south. The strike of the schist is about north and south (mag.), with a dip of 20° to the west. The ore occurs in veins, stringers, and lenses conforming to the strike of the schist, and consists of galena, zinc-blende, and pyrite containing gold and silver in a gangue of quartz. Samples of this ore taken from different parts of the upper and lower tunnel assayed from a trace to 0.05 oz. in gold to the ton; from 1.4 to 19 oz. in silver to the ton; from 4 to 10 per cent. in lead; and from 2 to 11 per cent. in zinc. The size of the veins, etc., appear to vary from ½ to 24 inches. Owing to the highly metamorphosed and consequent serpentinization of the schist and ore-bodies, it is almost impossible to distinguish the difference between ore and waste. The whole area developed by the tunnels over a distance of about 200 feet is mineralized and until the ore is found in place nothing conclusive can be said about average values. There appears to be sufficient mineralization, although low grade, to justify further exploration at depth.

### *Rock Creek.*

**Imperial.** This group of claims, situated near Rock Creek, was mentioned in the 1926 Annual Report. No further development-work has been done during the year. There is a low-grade ore-shoot varying from 4 to 10 feet in width and extending for about 170 feet in the lower tunnel. A shipment of this ore was made to the Trail smelter in 1926, the recovered contents of which were: Gold, 11 oz. to the ton; silver, 2,102 oz. to the ton; lead, 3,885 lb.; zinc, 1,339 lb. The width and persistency of this vein, located beside the Kettle Valley Railway, Kettle river, and within 4 miles of the high-power electric line, make it an attractive prospect.

### Greenwood Section.

**Sappho.** This old Crown-granted claim, situated about 2½ miles east of Midway and 1 mile south of Norwegian creek, close to the International boundary-line, has been leased by Alex. Bravard and associates, of Boundary Falls. During 1916–17–18 a total of 112 tons of ore was shipped to the smelter, carrying 197 oz. in silver and

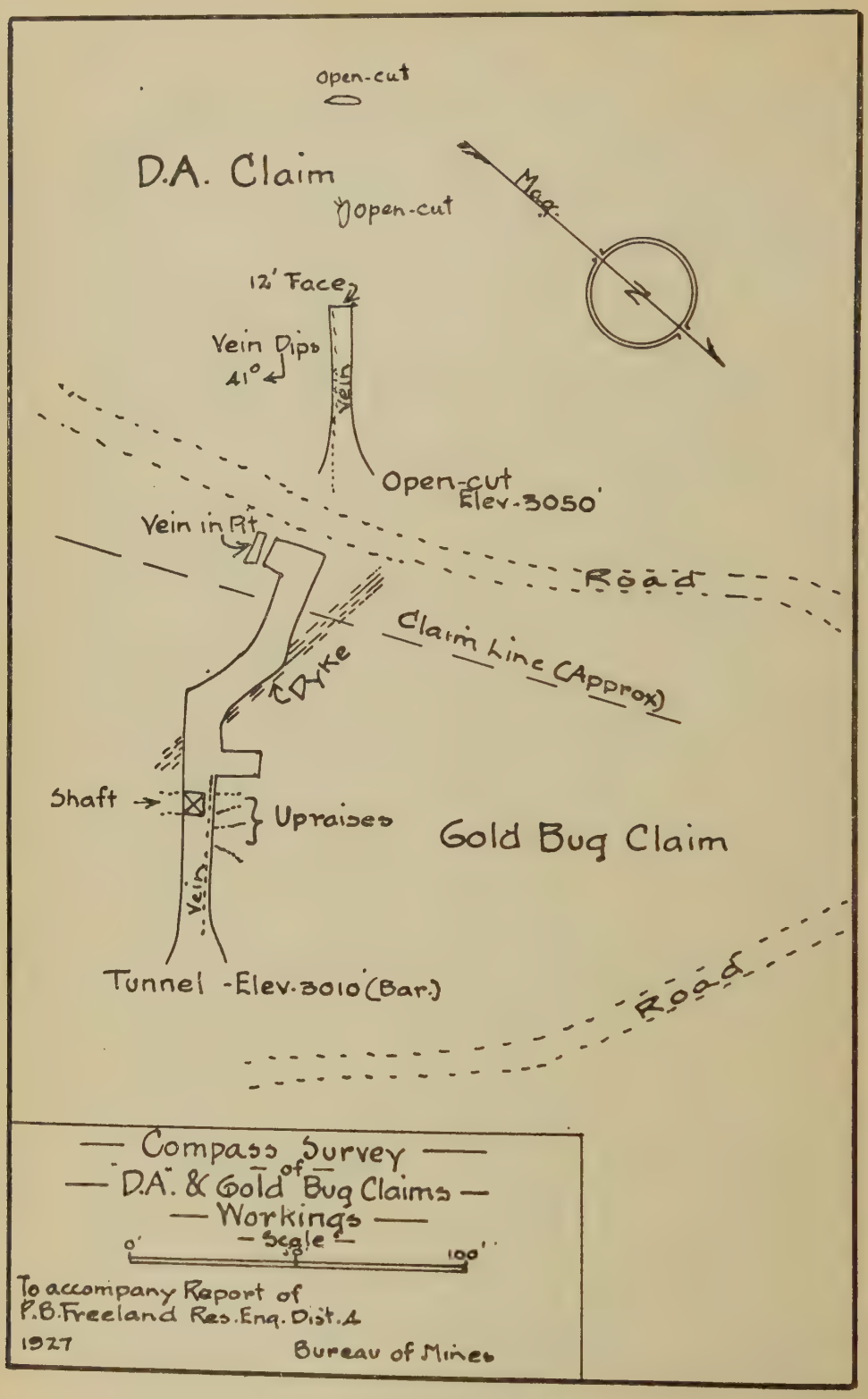
13,580 lb. of copper. Since that time no work was done until this year, when a crosscut tunnel was driven about 50 feet, having for its objective the bottom of the old workings, about 30 feet ahead of the face. The rock formations in this area, in which the mineralization occurs, are chiefly argillites, intruded by diorite, pyroxenite, and later by alkali-syenite-porphyry dykes. A sample of the chalcopyrite-pyrite ore from one of the lower shallow pits near the pyroxenite assayed 3.2 per cent. copper and 0.03 oz. in platinum to the ton.

The old workings consist of open-cuts and shafts of unknown depth and are now full of water. The presence of the pyroxenite rocks and the usual platinum contents associated with the copper sulphides is an added attraction to this locality. Although, as a rule, the ordinary smelters do not pay for the platinum contents because they have no equipment to recover the metal, there are specialists in this line of work who will remunerate the shipper if sufficient tonnage is guaranteed. The present price of refined platinum is between $60 and $70 an ounce.

**Vendella.** This claim, mentioned in the 1923 Annual Report, is owned by R. Pascoe and Bombini, of Greenwood. A lease and bond was taken by J. Wichser and associates on this claim and a small compressor and gasoline-driven engine installed. A lower crosscut tunnel has been commenced about 100 feet below the outcrop, having the contact of the greenstones and sedimentaries, which are mineralized with chalcopyrite and pyrite, as its objective. Driving long crosscut tunnels without doing sufficient development-work above has proved to be a costly experiment in the Greenwood camp, and further surface development before continuing the crosscut is to be recommended.

**Dynamo.** This claim, owned by Jerome McDonald, of Greenwood, is situated about three-quarters of a mile east of the town at an elevation of 3,400 feet (barometric). On the surface much shallow development has been done on two quartz veins varying from 2 to 12 inches in width and striking N. 25° W. and N. and S. (mag.). The north vein has been opened up by a 25-foot open-cut and a shaft 90 feet deep. At the collar of the shaft, and for 20 feet down, the vein averages about 6 inches in width, and from thence down it gradually pinches and faults near the bottom. A picked sample of this ore assayed: Gold, 5.60 oz. to the ton; silver, 15 oz. to the ton; lead, 19 per cent. The vein, which strikes N. 25° W., has been opened up by trenches and open-cuts for 60 feet. Samples from these workings also assay well in gold. On the south end of the property an 840-foot tunnel has been driven with the idea of crosscutting the veins mentioned. This tunnel cuts the volcanic tuffs and diorite and passes through a lamprophyre dyke containing very fine grains of pyrite and chalcopyrite. On the contact of the tuffs and diorite a quartz vein varying from 2 inches to 2 feet was developed. The strike of this vein varies from N. 35° W. (mag.) in the stope to N. 80° W. (mag.) in the drift, 100 feet ahead. Owing to the faulting and shearing of the tuffs this vein has been much displaced. A picked sample of this ore taken from the stope assayed: Gold, 0.62 oz. to the ton; silver, 7 oz. to the ton; copper, 1 per cent.; lead, 3 per cent.; zinc, 2 per cent. Owing to the high gold contents generally obtainable in these veins and the easy transportation facilities obtainable, further development seems to be justified. A survey of the 840-foot tunnel as well as the surface workings is to be recommended, so that their connection may be planned at depth. It seems probable that an extension of the tunnel for about 200 feet in a north-easterly direction should prove the value of these veins. The barometric elevation of the tunnel is 3,375 feet and the collar of the shaft is 3,540 feet.

**D.A.** This claim was mentioned in the 1925 and 1926 Annual Reports. During the year a syndicate called the J.R. Mines, headed by James Skilton, of Greenwood, was formed and some surface work done on the *D.A.* ground adjoining the *Gold Bug* claim. In past years some good ore was mined and shipped from the *Gold Bug*. The vein from which this ore was taken was cut off by a narrow porphyry dyke at the boundary-line between the two claims and its extension never discovered until this year. Open-cuts and stripping showed the continuity of the vein for at least 100 feet beyond the dyke and into the *D.A.* ground. A plan of some of the *Gold Bug* and *D.A.* workings is incorporated in this report. During the year a pipe-line was connected between the new workings and the compressor at the mouth of the old crosscut tunnel, about a quarter of a mile distant, and the open-cut extended. According to reports, the tunnel on the *Gold Bug* shown on the map is being driven ahead at the present time to intersect the downward extension of the vein. A picked sample of the ore from the open-cut assayed: Gold, 0.30 oz. to the ton; silver, 64 oz. to the ton; lead, 12 per cent.; zinc, 6 per cent. The location of this claim close to transportation makes its development attractive.


Open-cut
D.A. Claim
Open-cut
Mag.
12' Face
Vein Dips 41°
Vein
Open-cut Elev. 3050'
Vein in Pit
Road
Claim Line (Approx)
Clyke
Shaft
Upraises
Gold Bug Claim
Vein
Tunnel - Elev. 3010' (Bar.)
Road
Compass Survey of D.A. & Gold Bug Claims — Workings
Scale
0'
100'
To accompany Report of P.B. Freeland Res. Eng. Dist. 4
1927
Bureau of Mines

**Providence.** This old mine, situated about three-quarters of a mile north of Greenwood, was pumped out by the Madden Bros. and an examination made by Idaho and Victoria interests without any lease or bond being taken. It is understood that the Idaho interests advanced the money to have this work accomplished.

**Elkhorn.** This old mine adjoins the *Elkhorn Fraction* on the west and has been bonded by the Elkhorn Syndicate from Geo. White, of Greenwood. H. Howson, of Greenwood, is manager and C. Brett, of Nelson, is secretary of the syndicate. A compressor and electrically driven engine are being installed to facilitate driving a tunnel to tap the extension of the old vein to the south. This mine was reported upon in 1926.

*Jewel.*—A shipment of cleanings was made by Geo. White and associates from this old mine, situated at Jewel lake.

**Gold Drop.** Louis Bosshart, owner of this claim, situated 6 miles north-east of Greenwood, has been working steadily during the year on development. Some high-grade gold tellurides have been discovered from time to time in a quartz vein striking through the claim. Details about this ore appear in the 1925 Annual Report.

**Brooklyn and Idaho.** These claims in the old Phoenix camp are owned by R. Forshaw and others, of Greenwood. Old plans of the workings show that there is a possibility of finding some medium-sized bodies of copper-gold ore. These maps may be seen at the Mining Recorder's office in Greenwood and at the Resident Engineer's office at Grand Forks.

**New Jack of Spades.** This group, owned by Clement Vacher and associates, of Kelowna, is situated in Central camp near Greenwood. Development-work for the year consists of surface-trenching, open-cuts, and cleaning out some of the old workings at the higher elevations near the road. Some indications of copper sulphide, carbonates, and lenses of pyrite were uncovered.

## OSOYOOS MINING DIVISION.

**Big Horn Mines, Ltd.** (*Horn Silver.*) During 1927 the old Horn Silver Mining Company took out a Dominion charter under the above title with an authorized capital of 1,500,000 shares of no par value. B. W. W. McDougall has been appointed consulting engineer. During the year an average of eight men was employed chiefly in development of the mine. The mill was not operated. On the east side of the mine an upraise was driven 55 feet from the main crosscut. From the top of this upraise drifts were extended east and west on the vein. Later, according to the management, this upraise was extended another 51 feet and the vein intersected at this point east of the fault. The high-grade part of this vein measures from 14 to 18 inches in width and contains abundant native silver. A drift has been driven for over 20 feet on this ore. Apparently average mine-run samples have not been taken as yet, and until this is done nothing can be said regarding tonnage. Although the development of the mine has been slow owing to difficulties in financing, the ore newly discovered has been sufficiently attractive to warrant development on a larger scale.

**Dividend and Gipsy Fraction.** These claims are situated about three-quarters of a mile west of the motor-road between Osoyoos Custom-house and Oroville, in Washington, and approximately a mile north of the International boundary-line on the west side of Osoyoos lake. The present owner is J. E. Webb, c/o Chemung Canal Trust Company, Elmira, N.Y. A Crown grant wos obtained on these claims many years ago and most of the workings are caved in and not in a fit state for proper examination. A great deal of development-work has been done by tunnelling, sinking, and open-cutting, and, according to those familiar with the history of the mine, several hundred tons of copper-gold ore was shipped to the smelters.

The general formations of the locality, according to R. Daly, in a Geological Survey of Canada report, are quartzite, phyllitic slates, greenstones with limestone pods, intruded by a gneissic derivative of granodiorite. In the immediate neighbourhood of the main tunnels and shaft on the crest of the hill the cover-rocks have been intruded by a gabbro body. There seems but little doubt that this intrusive has been responsible for most of the mineralization in its vicinity.

On the *Dividend* a tunnel about 100 feet in length has been driven at the foot of a bluff. Near the mouth of this tunnel there are segregations and veins of pyrrhotite, pyrite, and specks of chalcopyrite in the argillite-beds. Near the face of the tunnel loose glacial material was

encountered. To the north-east of this tunnel, about a quarter of a mile distant, are the main workings and camp-site of the *Dividend*. Most of the buildings are in a dilapidated condition and unfit for use. At the mouth of the lower tunnel there is a high trestle and ore-bunker, a frame building housing a Fairbanks-Morse 12 by 12 140-r.p.m. gasoline compressor, and an assay office. This tunnel is driven S. 55° E. (mag.), with branches and connections to a shaft above. The total length is about 600 feet. The area traversed by this tunnel and its branches is entirely crushed, faulted, and metamorphosed. One main fault striking north and south (mag.) contains pebbles and crushed siliceous remnants of pyrite, and pyrrhotite in the drag. This fault dips nearly vertical and has evidently dropped the ore-body found in the upper levels below this horizon. No work has been done below this level. At a higher elevation of approximately 150 feet (barometric) another tunnel has been driven for 60 feet and the ore-body, which appears to have been about 10 feet wide, stoped out to the surface, about 30 feet above. Apparently this level is connected by an upraise or shaft to the lower tunnel. The strike of the ore-bodies is east and west (mag.), with a dip of 45° to the north. There are several large open-cuts in the vicinity of the upper tunnel which have uncovered segregations of massive pyrrhotite, pyrite, and copper carbonates. Near the top of the bluff above the first-mentioned tunnel open-cuts have been driven on the same class of material. About a quarter of a mile west of the main workings at a higher elevation of 150 feet another crosscut tunnel has been driven for 280 feet. The rocks here are also much disturbed and are mineralized in the fractures with pyrite and hæmatite.

On the *Gipsy Fraction*, to the north of this tunnel, three tunnels (now blocked and full of water) of unknown length have been driven. A sample of the ore on the dump from the tunnel lying farthest north assayed: Gold, 0.26 oz. to the ton; silver, 0.60 oz. to the ton; copper, 2.2 per cent. If there is any quantity of this class of rock in the mine it will pay the owners to clear out the debris blocking the mouth of the workings, so that proper investigations can be made. The Great Northern Railway terminals are at Oroville, in Washington, about 6 miles away, and it is probable that electric power is available from the plant on the Similkameen river above the town. There are old wagon-roads from the main thoroughfare up to the claims that can be reconstructed quite cheaply. The lack of timber and water except for domestic purposes is a handicap. A pump installed at Osoyoos lake (elevation 950 feet), about a mile east of the claims and about 200 feet lower in elevation, would supply sufficient water for a concentration plant. There is practically no frost in this region in the winter. The formations, which are heterogeneous and may be considered attractive for ore-deposition, warrant the expense necessary to clean out the workings.

**Morning Star.** This claim and others adjoining it in the Fairview camp, mentioned in other annual reports, are owned by Steve Mangott *et al.*, of Keremeos. The quartz veins on these claims, which vary from 6 to 20 feet in width, are gold-bearing and warrant further exploration. Transportation and electric power facilities are handy.

*White Lake Collieries, Ltd.*—During the year development of the surface coal-measures of this property was continued in a small way. The output was trucked to Penticton for consumption.

**Eclipse Mining and Milling Co.** This company owns the following group of claims, situated 5 miles south of Similkameen Station and three-quarters of a mile east of the motor-road: *Kreuger*, *Strathcona*, *Kitchener*, *Buller*, *Bobs*, *Otter*, *Crown*, *Apex*, *I.X.L.*, *Eclipse Fraction*, and *Helen*. W. Maneres, Penticton, is one of the company. Practically all the development-work has been done on the *Kitchener* and *Buller*. A tunnel driven about 650 feet on the *Buller* has developed a quartz vein varying from 2 inches to 5 feet in width containing pyrite carrying gold. From this tunnel a shaft has been sunk 72 feet where the vein widens and is heavily mineralized with pyrite. Short tunnels and open-cuts have also been driven on the outcrop of the vein 50 feet above this tunnel. The formation in which the ore occurs is schist. The granite batholith outcrops near the lower tunnel. On and within a few feet of the surface free gold has been found in the oxidized quartz. Numerous faults displace the vein in the lower tunnel and at the break a certain amount of pyritic enrichment has taken place. A sample taken across 5 feet of quartz in the back of the tunnel near the shaft assayed traces in gold and silver. A sample taken from the high-grade ore-dump assayed: Gold, 0.21 oz. to the ton; silver, 0.60 oz. to the ton. High gold values have been obtained from samples taken from time to time from different parts of this mine, and it seems reasonable to

suppose that they were due to the presence of free gold. It is possible that further development may uncover pockets of high-grade ore that will pay to ship, or even zones of medium-grade ore that might be economically concentrated, but up to the present this has not been done. A 10-ton shipment was made to the smelter at Everett many years ago. Unfortunately the smelter returns are unobtainable.

**Golconda.** This claim, owned by Dan McEachern, of Keremeos, is situated about a mile west of Olalla at an elevation of 1,000 feet above the motor-road. The property has been reported upon briefly in previous Annual Reports. Owing to interesting developments and a greater demand for molybdenite, one of the constituent minerals, a more detailed account is now given.

Transportation consists of a trail from the lower workings to the motor-road running between Penticton and Keremeos. The latter town, on the Great Northern Railway, is about 4 miles from the junction of the trail and road. Train service from Oroville to Princeton and return to Grand Forks via Keremeos is scheduled for Monday, Wednesday, and Friday, weekly. Connections can be made at Grand Forks for the Trail smelter or a direct freight-haul made to the Tacoma smelter. The topography in the vicinity of the mine is such that an aerial tram could be easily operated to the road below. The lack of timber will necessitate hauling timber for tower-construction. There is sufficient water for domestic use at the mine and, with storage, probably enough for a small concentration plant. The water constantly flowing in Keremeos creek at Olalla is used for irrigation and domestic purposes in the valley and its consumption for operating cannot be depended upon, chiefly on account of polluting the stream.

The formation in which the ore-bodies occur is schist intruded by either a fine-grained monzonite or a coarse-grained latite dyke. To the south the limestone-beds, tuffs, and other sedimentaries have been highly altered and silicified by the intrusion of pyroxenite rocks and the granite batholith. The latite dyke strikes in a north-easterly direction and beyond a slight pyritic mineralization has not influenced the ore-deposition.

In the upper tunnel, which is about 130 feet long, the lead averages 4 feet in width and consists of veins and lenses of nearly pure chalcopyrite, some pyrite and molybdenite in a gangue of quartz, carbonaceous matter and disintegrated wall-rock. On the foot and hanging walls there is from 2 to 3 inches of kaolin-gouge matter which is slickensided and shows a considerable amount of movement. At an elevation of approximately 130 (barometric) feet lower a crosscut and drift have been driven. Two shoots of ore, one 30 feet long and about 2 feet wide, another 100 feet in length and varying from 2 to 6 feet in width, have been developed in this tunnel. The ore occurrence in the vein is similar to the conditions found above, except that there is a higher percentage of chalcopyrite.

Shipments made from sorted ore have been as follows: To Mines Department, Ottawa, 1917, 3,390 lb. of molybdenite containing 17.1 per cent. $MoS_2$; to Trail, in 1918, 10 tons of chalcopyrite ore assaying: Silver, 1.7 oz. to the ton; copper, 18.6 per cent. Samples of sorted ore from the lower tunnel assayed: Gold, trace; silver, 1 oz. to the ton; copper, 7 per cent.; molybdenum, 1 per cent.; and: Gold, *nil;* silver, 2 oz. to the ton; copper, 14.1 per cent.; molybdenum, 0.40 per cent. The owner hopes to be able to interest sufficient capital to develop the mine and, if warranted, construct a small selective flotation plant to separate the chalcopyrite from the molybdenite. A shipment of 100 lb. will probably be made to the ore-dressing plant, Department of Mines, Ottawa, for preliminary testing purposes, and if this is successful a ton of this ore will be tried. Advices state that the market for molybdenum is much stronger and that there is a European as well as a United States demand. The price has varied between 50 cents and $1 a pound $MoS_2$. There is a duty of 21 cents a pound $MoS_2$ or 35 cents a pound Mo content going to the United States. Even if the molybdenum content is uncommercial the copper is sufficiently valuable to warrant further development.

**Hedley Gold Mining Co.** Operations on this company's property at Hedley continued throughout the spring, summer, and autumn. In the winter months, owing to the freezing of the Similkameen river and consequent shortage of water to run the power plant, operations cease. This season an ample supply of water enabled the plant to run until December 11th. Extensive exploration of several other properties in the vicinity of the *Nickel Plate* mine was carried on, but at the close of the season no ore of a high enough grade was found that could be used to "sweeten" the lower-grade ores in the mine, as well as stand transportation costs to the mill. Diamond-drilling was done in the mine in an

endeavour to locate new ore-bodies. The total tonnage mined and milled in 1927 amounted to 44,910.

**Nelson.** This group, owned by James McNulty, of Hedley, and situated in the Apex basin on Independence mountain, about 4 miles south-east of the *Nickel Plate* mine, was bonded during the summer by the Hedley Gold Mining Company. A shaft was sunk about 40 feet in the fragmentary volcanic rocks containing arsenopyrite. It is understood that at the bottom of the shaft the ore disappeared, so the bond on the property was dropped. The owner declares that he found the ore again later. Samples of this rock assayed from $9 to $30 a ton in gold. This group has been reported upon in the Annual Reports for 1923, 1924, and 1925, and appears to be a very likely prospect. A new road was built to within half a mile of this claim.

**Apex.** This claim and others adjoining, situated on the opposite side of the Apex basin from the *Nelson* group, were taken up by Vancouver interests. No work is reported to have been done. The ores found in the old *Apex* mine are similar to those found in the *Nelson*, only they occur in an altered limestone instead of volcanic rocks.

**Patsy.** This claim is situated on the east side of the mouth of Sterling creek, about 4 miles west of Hedley and close to the Great Northern Railway and the Similkameen river. The owner, D. H. McKinnon, of Hedley, has bonded this claim and those adjoining to T. J. Johnson and associates, of Denver, Colorado. Development-work consists of two tunnels and a 12-foot shaft. The quartz vein uncovered strikes about north-west and south-east, dips 80°, and has widened out from 3 inches to 3 feet, carrying values in gold and silver between $37 and $50 a ton. This mine is in the prospect stage as yet and more work is necessary before any definite statements can be made regarding its value as a producer. Close transportation, electric power, water, and timber are added attractions.

**Pollock.** This group, consisting of the *Pine Knot*, *Daisy*, and other claims, is situated about 1½ miles west of Hedley, on the south side of the Similkameen river, and half a mile south of the railway. A lease and bond was taken on this group by H. Guernsey and others, of Vancouver. The old workings were cleaned out and some exploratory work done on the vein extensions. A quartz vein impregnated with pyrite and arsenopyrite and varying from 6 to 10 feet in width has been developed along a northerly and southerly strike for 500 feet by shafts, tunnels, and open-cuts. The higher-grade arsenopyrite ore appears to lie in segregations and narrow veins either on the foot or hanging wall. A sample of this ore will average $25 a ton in gold. Average samples across the whole width of the vein run about $6 to the ton in gold. Neither of the shafts could be sampled, and the ore in the bottom, probably 50 feet deep, was not seen. The owners state that other veins have been discovered showing more consistent arsenopyrite contents and consequently higher gold values, up to $35 a ton. The veins on this hill are persistent and worth exploration.

Railway transportation, electric power, and water for all mining purposes lies within a mile of the claims, and the topography is such that the veins can be developed by tunnels. The elevation of main workings is 800 feet above the railway.

## SIMILKAMEEN MINING DIVISION.

Great activity prevailed throughout this Division and there were many prospectors in the hills intensively exploring the different mineral-belts. Although many attractive ore specimens were brought in, no spectacular finds were made. More work done on these prospects may uncover minable deposits. The lignite-coal situation at Princeton has been improved by the entry of sufficient American capital to put one of the mines on a working basis. In the winter months the successful operation of these coal properties has always been a comparatively easy matter owing to the increased domestic demand for fuel. In the summer this market is practically non-existent, and unless a manufactory demand can be obtained to consume the output the owners will find great difficulty in selling their product. Hopes have been held out by those interested in the production of by-products from coal, and although this scheme is chemically possible it is not commercial at this point at present, and the ordinary fuel market must be relied upon.

The coal-measures in this area cover about 50 square miles and have been reported upon before. The seams so far developed are generally wide, clean, and are a good grade of lignite,

Similkameen River at Mouth of Pasayten River.

Gibson Pass, Similkameen M.D.

Red Star Mine, Similkameen River.

Independence Mountain, Similkameen M.D.

but the necessity of shaft-sinking, except in one or two cases, and consequent expense of pumping water, add very materially to the cost of production. Both the Great Northern and Canadian Pacific Railways pass through Princeton, and owing to the fairly low topographical relief, extensions from either could be made without undue expense. The Great Northern Railway can handily supply the Washington market and the Canadian Pacific Railway any points within 200 miles in British Columbia.

### Granby Consolidated Mining, Smelting, and Power Co.

Operations by the Granby Company on its properties at Copper mountain, 13 miles from Princeton, and in the mill at Allenby continued throughout the year. A total of 757,625 tons of copper ore was milled, which produced 29,976 tons of concentrates. These concentrates were shipped to the Trail plant for smelting and refining.

At the mine new construction consisted of a bunk-house having sleeping capacity for eighty-five men. Each room has two beds and an independent radiator. Shower-baths and a "dry" have been installed on the first floor. Near the mouth of the sixth level (3,170 feet) a sorting plant has been built to eliminate waste rock. Two ore-bins are used, an old 450-ton one and a new bin of 1,150 tons capacity. The ore from these bins passes through two 30- by 42-inch jaw-crushers; the fines are conveyed to the 2,000-ton-capacity bins below and over the railway-tracks, and the coarser material passes over a 42-inch sorting-belt, where, since November, an average of twelve young men in charge of an experienced overseer pick the waste rock and dump it on to a 24-inch belt, which in turn carries it beyond the railway-tracks. The ore remaining on the belt is conveyed to two 10-inch fine reduction gyratory, 1½-inch size, crushers, and from thence over a 36-inch conveyor-belt to the 2,000-ton storage-bins, where it is ready for shipment to the mill. There is room for twenty waste-pickers if necessary. An afternoon and night shift are employed on this work. The ore hauled during the morning shift is taken from the stopes where there is no waste dyke or other rocks and consequently no sorting is required. This clean ore is crushed and passes directly to the storage-bins. Strong electric head-lights are installed over the sorting-belt. Owing to the sticky character of the crushed ore it was found advisable not to attempt washing before sorting.

Owing to the short time this plant has been running it is difficult to estimate its capacity for improvement as against cost. The results, if effectual, will mean that the stopes, containing ore intermingled with waste dyke-rock, can be profitably mined, which was impossible where large-tonnage mining methods have to be used. The light reddish-brown colour of the quartz-porphyry dykes offer an easy mark for the pickers. The management hopes that, with further experience, other darker waste rock may also be eliminated.

Three new levels have been driven between the No. 6 level and the No. 2, approximately 200 feet apart in elevation. At present these drifts are connected to the shaft by upraise and do not run out to the surface.

A new connection is being driven between the No. 2 and the No. 6 level by sinking and upraising. Owing to the necessity of bulldozing rocks too large to pass through the chutes, a system of grizzlies is being tried at the mouth of the ore-passes and all rock-breaking will be done before the rock enters the pockets. In other places pockets controlled by a grizzly above the chute are being tried. Now that the waste-sorting plant is in operation, ore is being mined in the cold weather from the glory-holes. A continued programme of diamond-drilling was carried on underground throughout the year. The porphyry dykes, which are generally badly shattered in the glory-holes, appear to be more solid at deeper elevations. A total of 350 men was employed underground and on the surface at the mine.

A 250-ton waste-pocket has been excavated below the No. 6 level. The waste rock passes through a chute at the bottom of this pocket into two 5-ton ground trams, operated by an electric hoist, and from thence across the railway-track. These trams are of the self-dumping type, having narrow-flanged wheels in front.

Improvements at the mill consisted of the addition of three 7- by 10-foot ball-mills and two standard 8-foot rake type, one 16-foot and one 18-foot Bowl classifiers, also one 40-foot settling-tank. The Forrester cell is being tried. Four old classifiers are being used to build dams below the mill. A new assay office has been built. This additional machinery has enabled the company to increase the tonnage handled from 2,200 up to 2,500 tons a day. The average number of men employed in the mill is 120.

PRINCETON MINING AND DEVELOPMENT CO., LTD. (N.P.L.).

This company is capitalized for $750,000, divided into 3,000,000 shares, par value 25 cents each. The directors are R. E. Berry, C. C. Hyatt, Hugh McLean, H. Rosenbaum, Vancouver, and Fred Foster, Princeton, with registered offices in Suites 18 and 19, 709 Dunsmuir Street, Vancouver. The group of claims controlled by this company consists of the *Copper Farm No. 1*, *No. 2*, *No. 3*, *No. 4*, and *No. 5*, *Margaret*, *Spokane*, *Monitor*, *Climax*, *Shepherd Creek*, *Vancouver*, *Quilt*, *Mineral Tip*, and *Spokane Fraction*, comprising an area of 780 acres and located about 4 miles east of Princeton, in the Similkameen Mining Division.

Mining facilities include plenty of timber, water for all purposes, high-power electric line about 2 miles distant, and railway transportation at the mine. Improvements consist of an 80-horse-power boiler, 3-drill Rand compressor, three machine-drills, blacksmith-shop, bunk-house, dining-room, office, etc., and a 250-ton ore-bunker.

The country-rocks are diorite overlain by andesite and intruded by quartz-porphyry dykes. The ore, consisting chiefly of pyrite, chalcopyrite, azurite, malachite, and occasionally tetrahedrite containing gold and silver, occurs in narrow brecciated lenticular shear-zones from 1 to 12 inches wide in a gangue of quartz, calcite, siderite, and disintegrated country-rock. The ore has been found both in the diorite and andesite. The porphyry, which is a later extrusive, cuts the ore and is unmineralized.

Developments are as follows: Lower tunnel No. 3, about 1,000 feet long, including crosscuts, elevation approximately 2,000 feet; No. 2 tunnel, elevation 2,160 feet and about 500 feet long, including crosscuts; two upraises connecting No. 3 and No. 2 levels and a blind upraise 50 feet high from No. 3. Numerous short tunnels, open-cuts, and pits have also been excavated over a distance of approximately 1,500 feet. The highest workings are about 1,100 feet above the No. 3 tunnel.

A report upon this property was made in July, 1927, by J. C. Haas, of Seattle, Wash., which is quoted in full as follows:—

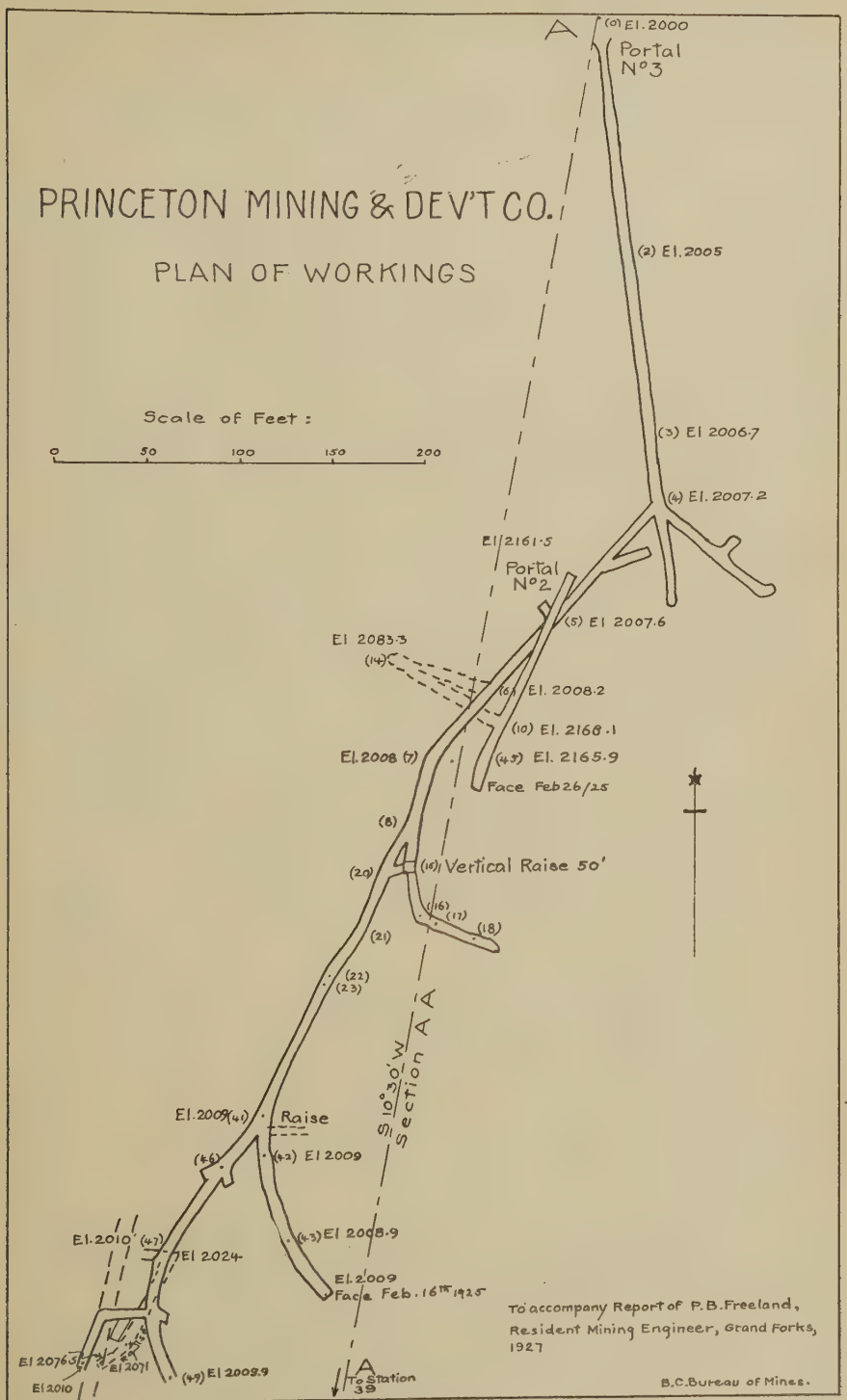
"This property is situated in the Similkameen Mining District, British Columbia, about 4 miles in an easterly direction from the town of Princeton. It is ideally located for economical development; the Great Northern Railway crosses the property for a distance of 3,000 feet, while the Canadian Pacific Railway is less than 3 miles distant.

"Development for a long time to come will be by means of tunnels, thus affording the cheapest and most satisfactory method of opening and working the mine. The electric-power line of the West Kootenay Power Company is 2 miles from your camp.

"You have an inexhaustible water-supply for mining and milling purposes in the Similkameen river, which flows only a few hundred feet from the mine. There is the finest kind of timber on the ground for mining purposes. Coal can be delivered at the mine in car-load lots at $2.50 per ton.

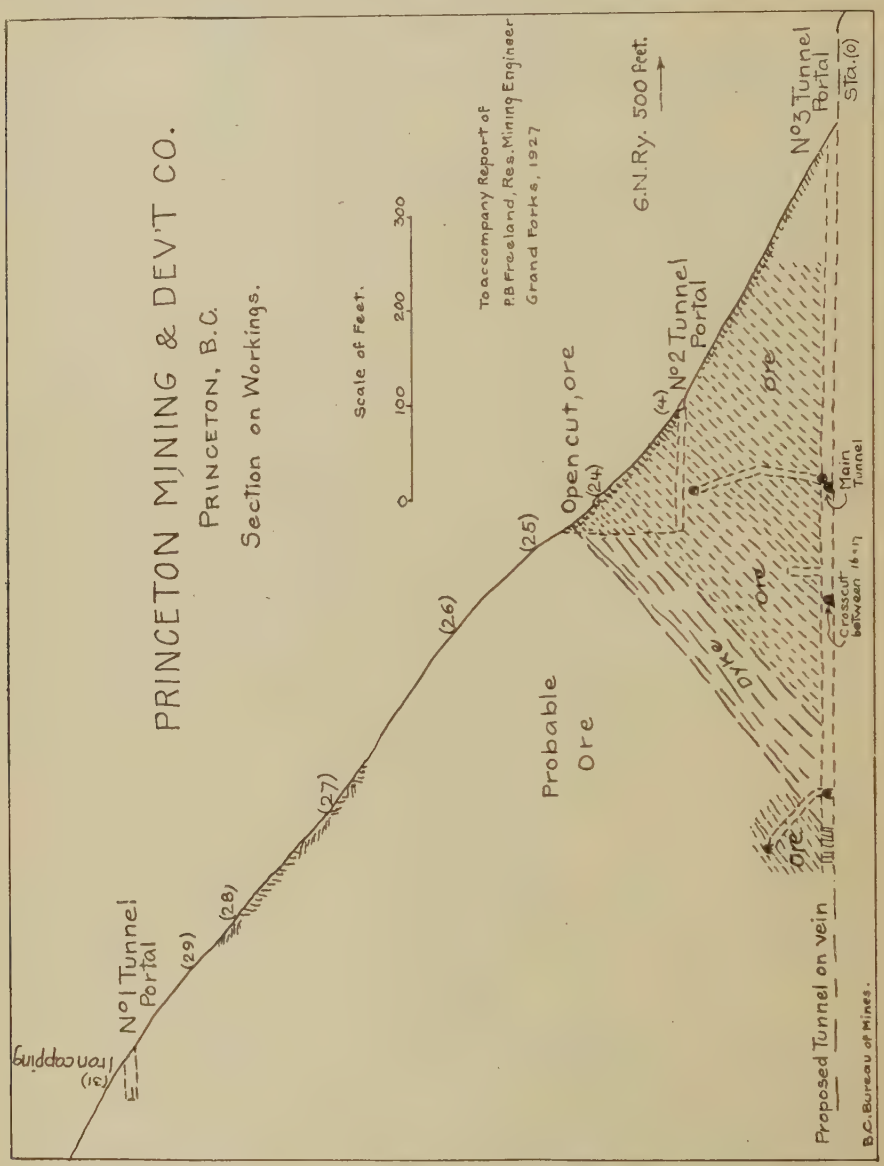
"At the present time the holdings of the company include six mining claims of about 50 acres each, known as the *Copper Farm*, *Copper Farm No. 1*, *Copper Farm No. 2*, *Copper Farm No. 3*, *Copper Farm No. 4*, and *Copper Farm No. 5*. Other claims are held under option by the Princeton Mining and Development Company, which option, it is anticipated, will be exercised. This will add largely to the company's holdings, so that eventually this will become one of the real big operating companies of the Similkameen District.

"The ore-deposits on this property have a general northerly and southerly strike. They occur as fissures and apparently shear-zones and are of good width. The rock formation in which the ore occurs is diorite and andesite, that in the deeper workings being of a dioritic nature, while higher it appears more of an andesitic nature. A quartz-porphyry dyke cuts across the strike of the ore-body at an angle of about 45° and shows a width on the surface of about 75 feet. The various streaks or strata of ore vary in width from a few feet to 15 to 20 feet or more. Some engineers have called these ore strata dykes, on account of their large size, varying, they state, from 50 to several hundred feet in width. The ore-deposits are made up of chalcopyrite, tetrahedrite (grey copper), pyrite, bornite, freibergite, and possibly other copper minerals in a gangue of quartz and feldspar. Many samples of ore have been taken by individuals and the company for assay at different times. These generally vary in values from 1 to 30 per cent. copper, 50 cents to $4 in gold per ton, and from 1 to 75 oz. silver per ton. At the time of my examination in July, 1927, samples were taken from various places in the mine


PRINCETON MINING & DEV'T CO.
PLAN OF WORKINGS
Scale of Feet:
0 50 100 150 200
(0) El. 2000
Portal No 3
(2) El. 2005
(3) El 2006.7
(4) El. 2007.2
El 2161.5
Portal No 2
(5) El 2007.6
El 2083.3
(14)
(6) El. 2008.2
(10) El. 2168.1
El. 2008 (7)
(43) El. 2165.9
Face Feb 26/25
(8)
(20)
(19) Vertical Raise 50'
(16)
(17)
(18)
(21)
(22)
(23)
A
S 10° W Section
A
El. 2009 (41)
Raise
(46)
(42) El 2009
El. 2010
(47)
El 2024
(43) El 2008.9
El. 2009
Face Feb. 16th 1925
El 2076
El 2071
El 2010
(49) El 2008.9
A
To Station 39
To accompany Report of P. B. Freeland, Resident Mining Engineer, Grand Forks, 1927
B.C. Bureau of Mines.

(*see* certificate attached), giving values in silver up to 52 oz. per ton, gold $1.20 per ton, and copper $68.76 per ton, total values for the ten samples running from $5.72 to $61.38 per ton. The metal prices used being: For silver, $56.25 cents per ounce; gold, $20 per ounce; and copper, 13 cents per pound.

"Of the samples taken as per attached certificate, No. 14 represents the ore from the face of raise from No. 3 tunnel, 900 feet in; the raise is 203 feet up and close to No. 2 now. There




were several hundred tons of good commercial ore taken out while putting up this raise, this ore now being on the dumps.

"No. 28 represents ore from above raise at a point 35 feet below face.

"No. 52 represents sample of No. 3 tunnel dump, of which there is probably 2,000 tons on dump.

"No. 37 is a sample across 20 feet at a point 150 feet south of dyke in No. 3 tunnel. No. 63 in No. 3 tunnel, taken from north of the dyke (towards portal) 350 feet, approximately to where

the vein was struck in this tunnel, general sample 350 feet in length. This gave a total value of $20.80 per ton. The ore-body on this level will have a width of 10 to 30 feet.

"No. 81 is a sample across 46 feet in No. 2 tunnel on vein.

"No. 66 across 6 feet on foot-wall side No. 2 tunnel. Thirty feet beyond where No. 81 was taken gave a value of $6.84 per ton.

"No. 23 is sample high-grade ore from No. 2 tunnel. This gave a total value of $61.38.

"No. 41 represents the ore from a very nice showing of grey-copper ore near top of hill, 800 feet above base; this ore-showing has a width of 3 to 5 feet and gives a total value of $50.67 per ton.

"On top of hill not far from portal of No. 1 tunnel is a big iron-capping; a heavy, massive cap of pyrrhotite, iron pyrite, and chalcopyrite; it strikes northerly and southerly and can be followed for many hundred feet and looks very well. This capping is very wide, should say from 35 to 75 feet. It is found as a contact deposit in andesite and carries values in gold and silver. This big cap is found again farther up the hill, where it shows some grey copper, also chalcopyrite. I believe when this capping is reached and cut under in the deep tunnels the big mine on this property will be developed.

"A Rand-Ingersoll steam-driven air-compressor is well installed in its own building. It is of 312 feet air capacity per minute and is capable of driving three regular machine-drills or two large and two small ones. The power is furnished by an 80-horse-power Gray boiler. It requires 45 horse-power to drive the compressor. The compressor is installed in a well-sealed room, 18 by 24 feet, leaving ample room for another compressor. The building is 42 by 52 feet, with coal-room in connection that would hold a car of coal.

"A well-equipped blacksmith-shop and store-room, with all necessary accessories and tools, occupies a portion of the engine-room. A 3-inch air-line leads into the mine. The compressor is equipped with automatic cut-out. Boiler-water is fed by injector and in addition has a Cameron feed-water steam-pump in reserve. A 1,500-gallon galvanized-iron water-tank is set up in boiler-room. The boiler is well set in brick and masonry setting. Boiler-room has plank floor with concrete in front of boiler. The safety of the building is ensured by the use of corrugated iron all around the boiler. In connection with compressor there are three Sullivan machine-drills, two drifters, and one stoper. In addition, there are all accessories, connections, hose, tools, etc., needed for such plant.

"A substantial ore-bin of 275 tons capacity has been erected at the lower workings, from which a railroad spur 800 feet in length has been built to the Great Northern Railway.

"A first-class mill-site is found adjacent to the ore-bin. Other buildings are bunk-house, mess-house, office, powder-magazine, and other necessary buildings.

"In No. 2 tunnel, on the south side of the dyke, the vein has been crosscut for a width of 52 feet and hanging-wall has not yet been struck. In No. 3 tunnel the vein was crosscut in raise at a point 65 feet above No. 3 tunnel, showing 35 feet of ore on the east and 7 feet on the west side, a total of 42 feet here.

"*Concluding Remarks.*—During the immediate future would suggest continuing development on No. 2 and No. 3 tunnels, driving ahead, crosscutting when necessary, and putting in raises to block out ore and prove tonnage. I should say that, with an adequate crew at work, enough ore should be developed and proven by the summer of 1928 to ensure a large, steady, and continuous ore-supply for a term of years. This ore can be treated ideally by oil-flotation method and should yield a saving of 90 per cent. or higher.

"Development has now proven the existence of substantial ore-bodies in shear-zones and fissures for a lateral distance of over 3,000 feet and to a vertical distance of over 1,100 feet. The character of the deposit and nature of the ore both will make for great depth and I have no doubt this will be a deep-seated mine.

"I have examined a great many mining properties in British Columbia over a term of thirty years and can say this is one of the most attractive properties I have ever examined.

"In conclusion, I wish to say that all work on the property has been well and economically done and reflects great credit upon Mr. Fred F. Foster, president and general manager of the company.

"(Signed) J. C. Haas, *Consulting Mining Engineer.*

"*Seattle, Washington, July 27th, 1927.*"

"*Certificate of Assay.*

"J. R. Williams, Provincial Assayer and Chemist. Office and Laboratory: Credit-Foncier Building, 850 Hastings Street West, Vancouver, B.C.

"I hereby certify that the following are the results of assays made by me upon samples of ores herein described and received from J. Cleveland Haas, Esq., Seattle, Wash., U.S.A., July 25th, 1927:—

| Marked. | Gold. | | Silver. | | Copper. | | Total Value (2,000 lb. per Ton). |
|---|---|---|---|---|---|---|---|
| | Ounces per Ton. | Value per Ton. | Ounces per Ton. | Values per Ton. | Per Cent. | Value per Ton. | |
| No. 14 | Trace | ..... | 1.60 | $0.90 | 15.80 | $41.08 | $41.98 |
| No. 23 | 0.03 | $0.60 | 3.60 | 2.02 | 22.60 | 58.76 | 61.38 |
| No. 26 | 0.06 | 1.20 | 2.80 | 1.57 | 6.30 | 16.38 | 19.15 |
| No. 28 | 0.03 | 0.60 | 1.60 | 0.90 | 14.50 | 37.70 | 39.20 |
| No. 37 | 0.03 | 0.60 | 2.40 | 1.34 | 2.00 | 5.20 | 7.14 |
| No. 41 | 0.02 | 0.40 | 52.40 | 29.47 | 8.00 | 20.80 | 50.67 |
| No. 52 | 0.03 | 0.60 | 3.00 | 1.68 | 6.50 | 16.90 | 19.18 |
| No. 63 | 0.02 | 0.40 | 3.00 | 1.68 | 7.20 | 18.72 | 20.80 |
| No. 66 | Trace | ..... | 2.00 | 1.12 | 2.20 | 5.72 | 6.84 |
| No. 81 | Trace | ..... | *Nil* | *Nil* | 2.20 | 5.72 | 5.72 |

Gold calculated at $20 per ounce. Silver calculated at 56.25 cents per ounce. Copper calculated at 13 cents per pound.

"(Signed) J. R. Williams, *Provincial Assayer.*"

In his concluding remarks statements are made that this ore can be treated ideally by oil-flotation, but no figures on tests made are given. The presence of oxides and carbonates associated with the ore in nearly every part of the mine is a factor that will have to be seriously taken into consideration before an oil-flotation plant is erected. It is possible that deep channel samples have been taken across stated ore-bodies—e.g., 52 feet in No. 2 tunnel—of which there is no evidence at the present time, and these samples assayed and then tested in oil-flotation units to prove that the assay and recovered mill-test values check. The ore-body in No. 2 crosscut is made up of a series of narrow shear-zones varying from ½ to 4 inches in width intermingled with barren country-rock. Owing to the fact that this ore does not persist in width from the roof to the floor of the tunnel, but pinches and swells, it will be necessary to cut wide and deep channel samples on both sides, the roof, and bottom of the level; if not already done, these samples should be assayed and tested for some economical method of recovery before any positive statements can be made regarding the value of the mine as a producer. Unfortunately it was impossible to examine the ore found in the upper part of the upraise owing to the chute being blocked. This ore, stated to be 42 feet wide, may vary in character and deposition from the ore found above in No. 2. From the portal to a point about 100 feet in No. 2 tunnel the shear-zone is highly oxidized, showing much copper carbonates. Near the face of No. 2 tunnel another porphyry dyke has been encountered, striking S. 45° E. (mag.). From the crosscut on No. 2 the tunnel has been driven 186 feet. Along the north-east side of this drift several stringers varying from 1 to 3 inches in width, containing pyrite, chalcopyrite, and malachite, have been struck.

Further development to the south at higher elevations seems to be warranted even if the mill tests do not give satisfactory results.

### Voigt's Camp.

Further diamond-drilling was done on some claims in this camp, situated on Copper mountain, by the Consolidated Mining and Smelting Company, the results of which are not to hand. This group has been Crown-granted by the above company.

### Siwash Creek Section.

This section embraces an area 20 miles long and 2 miles wide, between the source of Hayes creek and the headwaters of Siwash creek, through which the latter stream flows. In the early

days a good deal of gold-placer mining was done, chiefly on the benches above the creek. Since that time, probably thirty years ago, this type of mining has been intermittent. The reason appears to lie in the fact that values are "spotty." The source of this gold has never been located, but the appearance of the gravels suggests that they are of glacial origin and may have been brought from the north-west.

Siwash creek has cut a deep channel into the igneous rocks and glaciation has completely eroded any rock sediments that may have existed. Nothing but remnants remain, riding high on the ridges well back from the present stream. Numerous prospects have been partially developed, but no work at depth has been done except on the *Renfrew* claim. Mineralization occurs in quartz veins which have been exposed by the present channel of the creek. On the benches adjacent to the stream there is a deep covering of glacial debris which makes prospecting difficult. The country-rocks mainly in evidence are granite porphyry and fine-grained diorite, cut, especially in the vicinity of the quartz veins, by lamprophyre and alkali-syenite dykes. In several instances quartz veins containing galena and sphalerite are found in the granite porphyry. It seems probable that this porphyry has been disturbed by some later intrusive and the shear-zones filled at that time. Transportation consists of a trail from Jellicoe Siding on the Kettle Valley Railway on the east side of the creek.

**Mabel.** This claim, owned by F. Bailey and G. Price, of Jellicoe and Princeton, is situated about 10 miles up Siwash creek on the west side. Development-work consists of open-cuts, ditches, a 6-foot shaft and a 35-foot tunnel driven on a series of quartz veins mineralized with hæmatite, pyrite, and chalcopyrite. Extreme faulting has thrown the vein down the hill to the south and the owners have had considerable difficulty in following it. A sample of this ore carried a trace in gold and 3 oz. in silver to the ton.

**E.J.A., B.H., H.J.B., and Owen.** This group of claims lies 1 mile to the north of the *Mabel* claim on Siwash creek and was mentioned in the 1925 Annual Report. Since that time, according to advice received from Frank Barber and partner, who are working on the *E.J.A.* claim, the tunnel on the west bank of the creek has been driven about 40 feet and the vein has widened to 4 feet 6 inches, with 28 inches of good ore in the face. Samples taken from this vein before the above work was done assayed: Gold, 0.20 oz. to the ton; silver, 63 oz. to the ton; lead, 24 per cent. Better values than this will be required before the ore can be shipped direct to the smelter.

**Renfrew.** This claim, formerly known as the *Snowstorm*, is located about 18 miles up Siwash creek from Jellicoe Siding, on the east side. In 1926 the Lade Bros. and T. Otto, of Vancouver and Victoria, leased the mine and shipped, by pack-horses and railway, 27 tons of silver-lead ore to the smelter at Trail.

Development consists of an upper tunnel about 90 feet (caved near face), elevation 4,655 feet (barometric); No. 2 tunnel, 36 feet, with two wing-tunnels 40 feet each, elevation 4,610 feet; and No. 3 tunnel, 138 feet long, elevation 4,490 feet, besides several open-cuts and trenches dug to determine the strike and continuance of the vein. In the upper tunnel the vein, averaging 10 inches in width, has been stoped to the surface for 21 feet near the mouth; beyond that point it pinches and is faulted, as far as could be seen. In No. 2 tunnel the vein varies from 6 to 10 inches in width and has been stoped for 20 feet, near the mouth, to the upper tunnel. In the wing-drift, N. 32° E. (mag.), another stope has been driven, having a maximum height of 12 feet. The vein in the face of this tunnel on the floor measures 14 inches and is well mineralized. In the lower tunnel an attempt was made to find the vein in place on the extension of its strike to the south-west. Owing to the extremely shattered nature of the ground, only displaced remnants of the vein-matter were found.

The ore-minerals are galena, pyrite, argentite, tetrahedrite, and arsenopyrite in a gangue of quartz. The main mass of country-rock as far as could be seen is granite porphyry. A black fine-grained lamprophyre dyke follows the foot-wall of the ore in the two upper levels and has probably been the disturbing factor which displaced the veins. Realgar is found in small segregations in the shattered rocks close to the vein. The strike of the vein varies between N. 17° E. (mag.) and N. 65° E., with a dip of 55° S.E. The vein in the face and bottom of No. 2 tunnel is well mineralized and appears to be widening. The shipment of 27 tons contained 3 oz. in gold, 3,379 oz. in silver, and 1,578 lb. of lead. There is a good log cabin which will accommodate about six men.

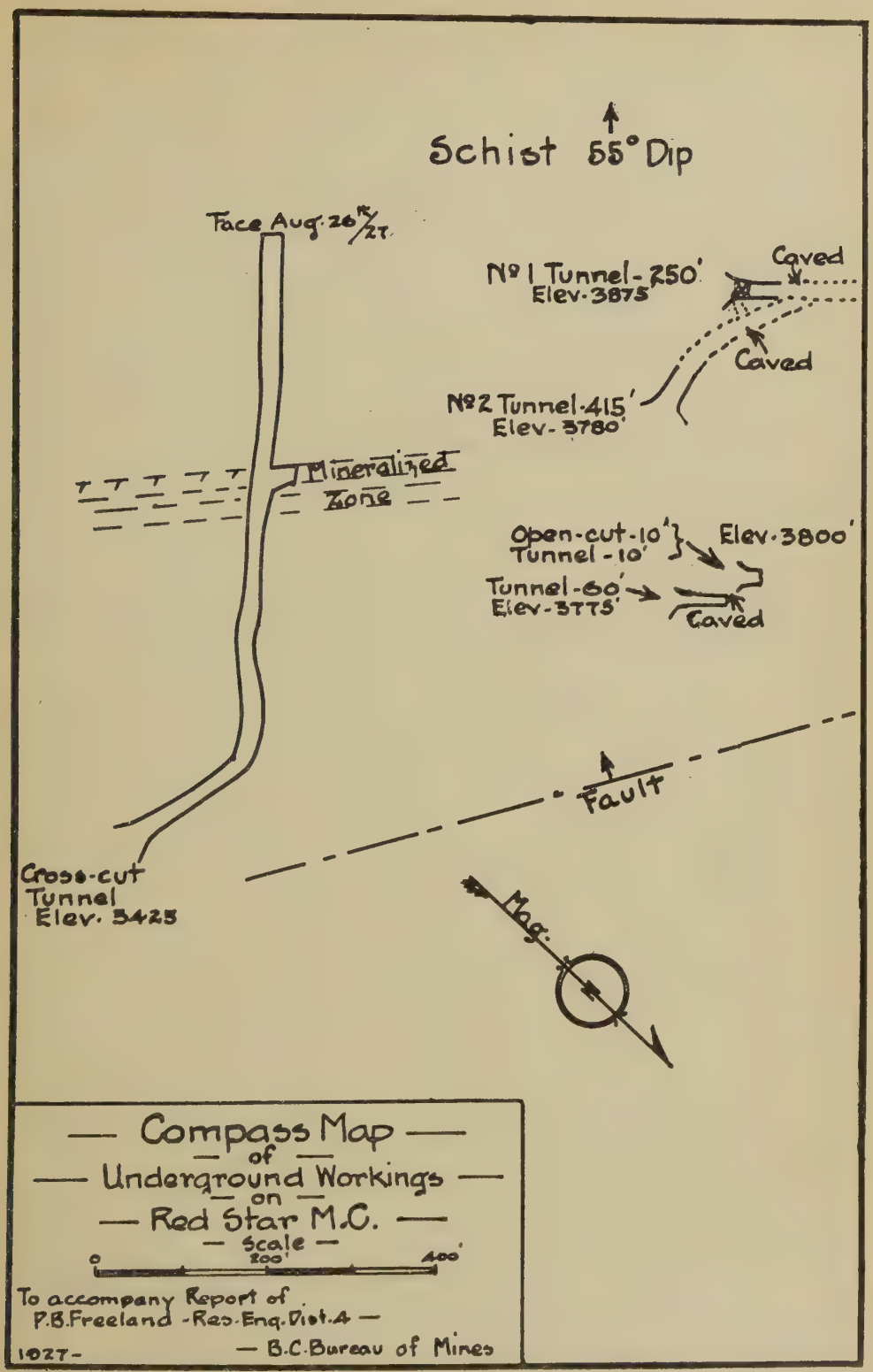
**Blue Stone.** This claim, owned by F. Barber and W. Cunningham, of 1-Mile, Princeton, is located about three-quarters of a mile west of the *Renfrew* on Siwash creek. Development-work consists of open-cuts on the top of the ridge and a tunnel on the vein 165 feet in length and 50 feet lower in elevation. The strike of the vein is S. 76° W. (mag.), with a dip of 77° N.E. Owing to a cave near the face of this drift the vein could not be examined entirely. The width of the vein where seen varied from 1 to 4 inches. The ore-minerals are tetrahedrite, pyrite, and occasional segregations of galena and sphalerite in a gangue of quartz. On the surface and in the tunnel the ore was almost entirely oxidized and leached, showing a heavy azurite-stain. The vein occurs in a brecciated zone of diorite about 25 feet wide. To the north and west the diorite is cut by a wide dyke of pulaskite porphyry. Owing to the leached condition of the vein in the tunnel it seems advisable to drive another drift on the lead at a lower elevation. A steep ravine below the mouth of the tunnel permits taking about a 100-foot lift on the strike of this vein. A sample of ore assayed low in silver, due probably to extensive leaching.

**Argentite.** This claim, formerly owned by Mike Gaynor, of Granite Creek, is situated about 1½ miles south-west of the *Renfrew*, on the opposite side of the creek. A 30-foot open-cut and 60-foot crosscut have been driven on an oxidized zone created by the intrusion of a porphyry dyke into the diorite. Veinlets of quartz containing pyrite have been formed in the rock fractures. Although some good values were obtained formerly, check samples carried no values.

**Lucky Strike.** This group, consisting of the *Lucky Strike No. 1*, *No. 2*, *No. 3*, *No. 4*, *No. 5*, *No. 6*, *No. 7*, and *No. 8*, is located about 5 miles north of Princeton, within a mile of the Kettle Valley Railway on Hayes and Summers Creek divide. The owners are G. Broderick and sons and T. Hume, of Princeton. Development consists of many open-cuts, a 10-foot shaft, and three tunnels, about 75, 35, and 25 feet long respectively, over a distance about 1,000 feet in length. The country-rock outcropping near the workings is a metamorphosed basalt intruded by tongues of light, coarse-grained feldspathic pegmatite. The ore-minerals, chalcopyrite and pyrite, occur in and near the contact of the pegmatite and it seems reasonable to suppose that this rock is responsible for the ore-deposition. About a mile to the north the granite batholith forms the bulk of the main ridge skirting the north-west side of Hayes valley and the pegmatite apophyses are probably offshoots from this mass. The gangue of the ore consists of quartz and epidote, impregnated with pyrite and chalcopyrite and much malachite-stain in the rock fractures. In practically all the workings the rock is fractured and displaced. No deep development has been tried. The owners are not financially able to exploit this mineralized area at depth, and it is advisable for them to confine their efforts to surface-trenching and open-cuts to disclose, if possible, the total extent of the mineral-zones. Transportation facilities for railway and motor traffic are excellent and there is plenty of water and timber on the property. This is a prospect worth exploration.

### Upper Similkameen Section.

**Sparkler.** This group, situated on Cambie creek, a tributary of the Similkameen river within about 6 miles of the headwaters, was mentioned in the Annual Report for 1925. Since that time C. Richter and W. Wadsworth, of Keremeos, continued prospecting the mineral-outcrops on Bonanza and Coldwater creeks. There are sixteen open-cuts along the side of the creeks on the different veins and recent developments show a decided increase in width at a maximum depth of 20 feet from the surface. Samples taken from the cuts to the south-west on Bonanza creek, containing a high percentage of pyrite, arsenopyrite, sphalerite, and chalcopyrite, assayed: Gold, 0.34 oz. to the ton; silver, 0.60 oz. to the ton; arsenic, 16.2 per cent. The copper contents were not assayed. On Coldwater creek new bodies of ore were opened up, showing a heavy mineral content. An intrusion of gabbro in contact with a narrow tongue of pyroxenite cuts the sedimentaries at the falls on this creek. Similar minerals occur in the gabbro and no doubt this intrusive has been responsible for some of the ore-deposition. The contacts of this rock and the sediments offer the best locality for further development. In spite of the low values obtained up to the present, the extent of the mineralization and distinct widening at depth warrants more exploration. These claims are reached by trail from the 9-Mile bridge south of Princeton and from thence over the Hope trail to a point about 2 miles north of the summit, where a side-trail turns to the left over Nicomen ridge and down to the Similkameen river, skirting the south-west slope of the Three Brothers mountain.


Schist 55° Dip
Face Aug. 26th/27
No 1 Tunnel - 250'
Elev. 3875'
Caved
Caved
No 2 Tunnel - 415'
Elev. 3780'
Mineralized Zone
Open-cut - 10'
Tunnel - 10'
Elev. 3800'
Tunnel - 60'
Elev. 3775'
Caved
Fault
Cross-cut Tunnel
Elev. 3425
Mag.
— Compass Map —
— of —
— Underground Workings —
— on —
— Red Star M.C. —
— Scale —
0
200'
400'
To accompany Report of
P.B. Freeland - Res. Eng. Dist. 4 —
1027 -
— B.C. Bureau of Mines

**Red Star.**

This group of claims, consisting of the *Red Star*, *Anaconda*, and *Hill Side Fraction* and located about 22 miles in a direct line south of Princeton, are owned by C. Bonniver and B. Powell. A map of the underground workings is incorporated in this report, showing the extent and nature of developments. Owing to the upper workings being caved nothing definite regarding ore found can be reported. Parts of these upper workings were examined many years ago and a general idea of the ore-deposits obtained. The lower crosscut tunnel was driven with the idea of tapping the vein system at a depth considered to be low enough to avoid the extreme shearing noticeable above. The rock in which the ore occurs is a chlorite-schist. The ore, consisting of pyrite, chalcopyrite, chalcocite, and sphalerite in a gangue of quartz, occurs in veins, lenses, and stringers conforming to the strike of the schist. The dip varies from 51° to 61° to the south-west. To the north of the workings a main fault striking south-east has displaced the entire block of ground developed and thrown it to the south-west. Numerous minor slips and faults have thrust the vein system in the same direction.

The mineralized zone mapped in the lowest tunnel is evidently the one discovered above and to the north, whilst the downward vein extension of the most westerly upper workings lie beyond the face of this tunnel and are still to be developed. The short drift driven on part of this zone uncovered a general mineralization of the ore mentioned above, with the addition of zinc. A sample of this material assayed: Gold, 0.04 oz. to the ton; silver, 1 oz. to the ton; copper, 0.8 per cent.; zinc, 18 per cent. Picked ore from this vein will carry higher values in copper. The surface outcrop and workings above show extensive oxidation and much malachite in the fractures. Heavy pyrite-chalcopyrite ore assayed: Gold, 0.04 oz. to the ton; silver, 2 oz. to the ton; copper, 5.5 per cent. Owing to the shearing of the schists, especially where the veins occur in the upper workings, the timber has been crushed and the tunnels caved. These claims lie beside the Similkameen river (Roche), on the old Trans-Provincial road survey, and about 18 miles from the present road. Timber and water are plentiful. There is a good six-man log cabin on the property. Seeing that better ore occurs in the most westerly workings, it seems advisable to drive the lower tunnel ahead to intersect this vein system.

**Roche and Paysayton.**

These claims are located on the north-west side of the Similkameen river, about a mile below the *Red Star* group, and are owned by John Crowley, of Princeton. Development-work consists of a lower tunnel 168 feet in length and a tunnel 25 feet higher in elevation and 130 feet long, as well as numerous shallow shafts, open-cuts, and trenches on a quartz vein in chlorite and sericite schist. On the surface the vein varies from 2 to 12 inches in width and has a general strike to the south-west (mag.). Faulting has thrown the south end of the vein down the hill. In the upper tunnel the vein strikes S. 65° (mag.) for 45 feet and varies from a fracture to 8 inches in width. Beyond this point a fault has thrown the vein down the hill and the strike corresponds with the faulted vein stripped on the surface. In the lower tunnel the vein is completely broken and occurs in disintegrated pieces. The warping and striæ show that the schistose rocks have been thrust downward and over towards the south-east.

The ore-minerals are chalcopyrite, bornite, pyrite, tetrahedrite, azurite, and specks of grey mineral which are possibly one of the tellurides. A picked sample of ore from the lower tunnel assayed: Gold, 0.14 oz. to the ton; silver, 0.60 oz. to the ton; copper, 4.5 per cent. Sorted ore from the upper tunnel assayed: Gold, 4.14 oz. to the ton; silver, 1.8 oz. to the ton. The copper content of the last sample was not assayed. The heaviest mineralization occurs at or near the faults, which probably means that there has been a certain amount of enrichment after faulting. A compass survey was made of this development. A good log cabin has been built on this claim.

**Knobb Hill.**

This claim, owned by John Broman, of Princeton, lies about 1½ miles south of the *Red Star*, on the same side, and three-quarters of a mile from the river. Development-work consists of numerous open-cuts and a crosscut tunnel 157 feet long. Two shear-zones, one 8 feet and the other 6 feet wide, at 40 feet and 97 feet respectively from the mouth of the tunnel, were intersected. The mineralization in both zones is pyrite, hæmatite, chalcopyrite, and streaks of fine sooty psilomelane. The schist strikes from N. 33° W. (mag.) to N. 40° W. and dips from 33° to 53° S.E., and the ore-bodies conform to this strike. A picked sample of ore assayed: Gold, trace; silver, 0.60 oz. to the ton; copper, 9.8 per cent. No work has been done underground on the strike of these shear-zones. There is a cabin on the property and plenty of timber and water for mining purposes. A side-trail connects the workings with the main Similkameen River route.

WHIPSAW SECTION.

S. & M. and Marian.

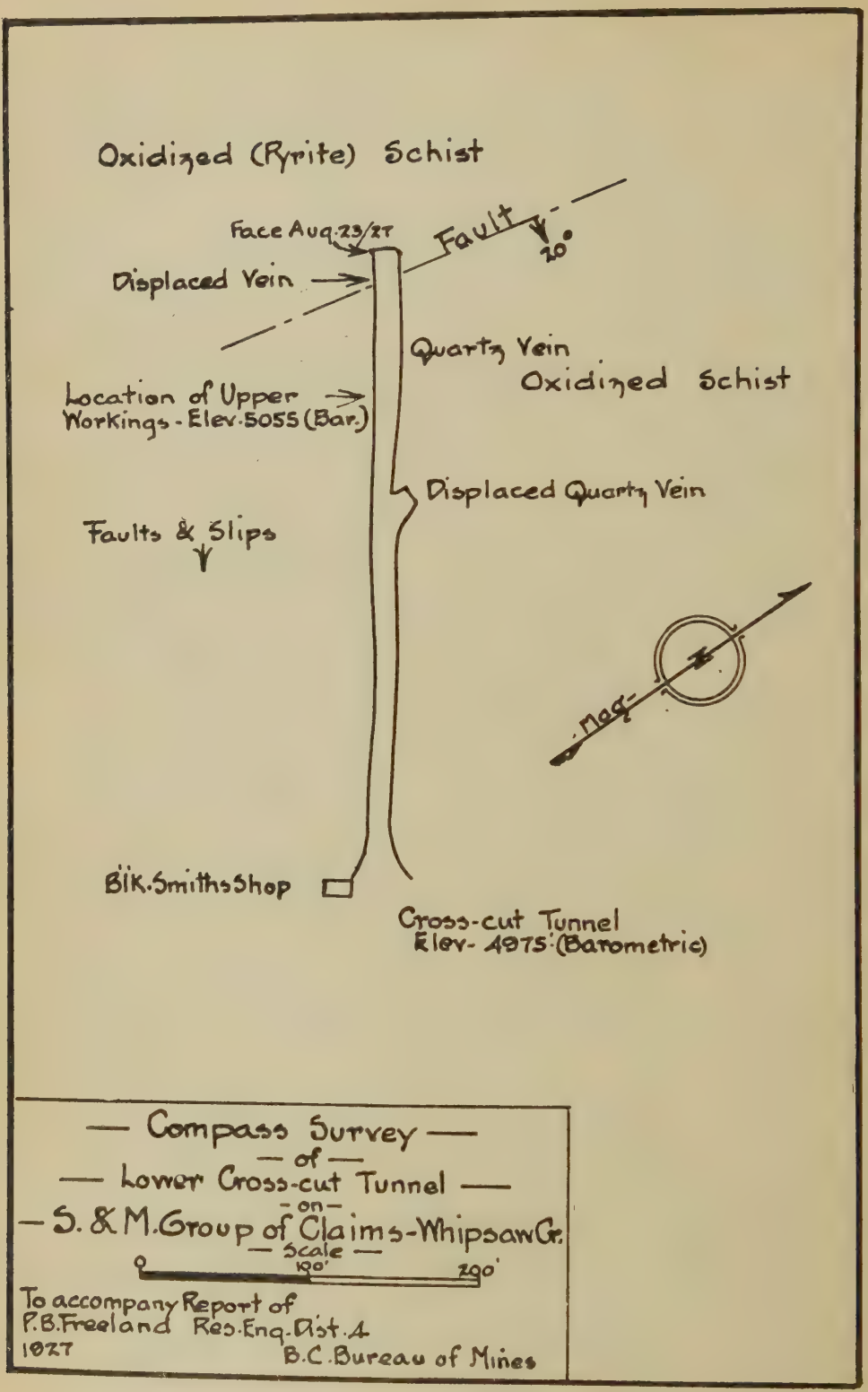
(Pacific Slope Mines, Limited.) This group, consisting, according to statements in the company's prospectus, of thirteen claims, including the *Marian* and *S. & M.* claims, is situated about 21 miles slightly west of south of Princeton, on Whipsaw creek. The recorded owners, Samuel Spencer and Marian Spencer, of Princeton, bonded these groups to P. H. Fraser, of Vancouver, and a private company, called the Pacific Slope Mines, Limited, with a capital of $250,000, divided into 250,000 shares, par value $1 each, was formed.

The prospectus prints extracts from the Geological Survey Report of C. E. Cairnes, written in 1922, page 119–120A, who in turn has quoted an extract from Dr. Camsell's report, 1911, page 123. In the middle of paragraph (3), *re* development on the *S. & M.* group, the following sentences have been left out in the prospectus, namely: "The entire belt is more or less sparingly mineralized with iron and copper sulphides and, according to the owner, has assayed $2.50 in gold. The principal values are, however, regarded as occurring in a number of stringers of ore from a fraction of an inch to 2 or 3 inches wide. These are composed chiefly of galena." The prospectus continues to quote that "A picked sample of the ore assayed by the Mines Branch, Ottawa, gave 151.8 oz. silver, 48.5 per cent. lead, and 1.70 per cent. zinc." The size of the veins has not been given in the prospectus. Paragraph (4), page 120A (Cairnes's report), under *Marian* group, has also been left out, and as part of it has an important bearing on the meaning of Dr. Cairnes's report it is quoted as follows: "The occurrence of the ore is, as is characteristic of this type of deposit, very irregular. The total zone of mineralization includes a belt 300 to 400 feet wide adjoining the granodiorite. Only in relatively small sections of this, however, is mineralization sufficiently heavy to be of economic importance, and even in these the values are low. The zone of mineralization follows the intrusive contact for a mile or more and is confined chiefly to the different limestone-beds within this belt. The ore-bodies even within these beds are very irregular in outline and variable in mineral composition." The above paragraphs describe exactly the conditions of mineralization on these properties. There was no change (August 23rd) in the deeper developments on the *Marian* and on the *S. & M.* Although the veins were wider, the chief vein constituent was quartz.

Development done since the company was incorporated is as follows: On the *Marian* a tunnel 92 feet long, driven about 50 feet in a northerly and southerly direction and 42 feet N. 72° E. (mag.), at an elevation of about 10 feet below the old tunnel-workings. In this tunnel two narrow veins were cut, one about 4 inches and the other about 2 inches wide, containing pyrite and sphalerite. A picked sample of this ore assayed: Gold, 0.06 oz. to the ton; silver, 3 oz. to the ton; zinc, 11 per cent. There is about 5 tons of low-grade ore on the dump. If this tunnel had been driven diagonally across from the mouth to the face the same ground would have been prospected. Ample evidence of the vein system was procurable on the surface and in the old workings. These deposits are associated with the limestone-beds and are of contact-metamorphic origin. Highly altered remnants of limestone occur in the old tunnel-workings, containing pyrite, pyrrhotite, and sphalerite in a gangue of epidote, garnetite, and quartz. The contact of the chlorite-schist is exposed in these old workings and the width of the folded limestone measures about 8 feet. The strike of the vein system is about N. 40° W. (mag.) and conforms to the strike of the schist. No work was being done on the *Marian* on August 23rd, 1927.

On the *S. & M.* old development-work consists of open-cuts, shallow shafts, and several tunnels driven in a decomposed chloritic schist which forms a belt about 250 feet wide. The schist is mineralized with pyrite, with occasional segregations of chalcopyrite. Tunnels driven in this belt have nearly all caved. Samples of this rock assayed a few cents in gold and silver. The principal values occur in a number of stringers of ore from a fraction of an inch to 2 or 3 inches wide. The galena ore, where seen, occurs in disseminated crystals associated with sphalerite and pyrite, and in lenticular disintegrated nodules a few inches in length and diameter. Owing to caving several of the old tunnels were not inspected, and there may be stringers of ore in them that are chiefly composed of galena. The ore in the dumps contains only a small percentage of galena.

New development (August 23rd, 1927) consists of a tunnel about 364 feet long, driven about 80 feet (barometric) in elevation, below and directly under the lowest old workings (*see* map).


Oxidized (Ryrite) Schist
Face Aug. 23/27
Fault
20°
Displaced Vein
Quartz Vein
Oxidized Schist
Location of Upper Workings - Elev. 5055 (Bar.)
Displaced Quartz Vein
Faults & Slips
Mag.
Blk. Smiths Shop
Cross-cut Tunnel
Elev. 4975' (Barometric)
— Compass Survey —
— of —
— Lower Cross-cut Tunnel —
— on —
— S. & M. Group of Claims - Whipsaw Cr.
— Scale —
0
100'
200'
To accompany Report of
P. B. Freeland Res. Eng. Dist. 4
1927
B.C. Bureau of Mines

Three displaced pieces of quartz veins were discovered at different points in this tunnel varying from 2 inches to 2 feet in width. Picked samples from the vein 18 feet from the face assayed: Gold, 0.06 oz. to the ton; silver, 9 oz. to the ton; lead, 8 per cent.; zinc, 8 per cent. A sample of ore from the short drift about 204 feet from the mouth of this tunnel assayed a trace in gold and silver.

The schistose rocks are badly crushed and faulted throughout the length of this tunnel. The main slips show a movement of at least 6 feet in a south-easterly direction down the hill. The vein found 18 feet from the face has also been pushed in this direction and nodules of ore occur in the drag of the fault. On the north side of the tunnel, 292 feet from the mouth, a piece of practically barren quartz 2 feet wide was exposed. In the 14-foot drift, 204 feet from the mouth of the main tunnel, another quartz vein 18 inches wide was found. The ore in this vein was mostly pyrite and sphalerite and occurred in narrow veinlets and segregations in the quartz. Near the roof of the tunnel the vein feathered out into stringers; on the floor it appeared to be more permanent. The pieces of ore, where found, are too low grade to be either shipped to or milled at Trail or on the property. The highest possible ore tonnage estimate at the time of examination can be placed at 50 tons from all workings. The broken condition of the ground in which the veins occur prohibits low-cost mining.

Transportation consisted of a motor-road 9 miles in length, from Princeton, the railway terminal, to 9-Mile bridge, and from thence 13 miles over the Hope trail to a point directly below the workings on the *S. & M.* claim. In the autumn the company, under the direction of P. H. Fraser, commenced building a road to the claims. Assistance for this project was asked for so that ore could be hauled out and mill machinery taken in for ore reduction. Consideration of a concentration plant was entirely too premature, for the following reasons: Little was known regarding the class of ore that would have to be treated; therefore the type of machinery could not be either planned or constructed, and there was only sufficient tonnage to operate a plant for a few days. More development and exploitation at depth of some of the stringers outcropping on the surface and found displaced in the upper workings seems to be warranted on the *S. & M.* There is plenty of timber and water available on and below the claims. The Hope trail, which has been built on a fairly uniform grade, in many places traverses flat benches, and with a little widening in some of the cut-banks an engine and compressor for development could be hauled in comparatively cheaply over the snow. Some of the ore from the *Marian* and *S. & M.* was packed out over the trail on horses and has been left beside the road at the 9-Mile bridge.

*Kennedy Mountain.*

**Red Buck.** This claim, located on Kennedy mountain, close to the Similkameen river and about 11 miles south of Princeton, is owned by Geo. Allison and Chas. Reveley, of Princeton and Vancouver. No work has been done for many years on the claim and the tunnels and open-cuts are partly caved. An examination of the lowest tunnel, supposed to be 200 feet long and caved about 100 feet from the mouth, disclosed extensive fracturing of the diorite rocks, which are oxidized and mineralized with chalcopyrite, malachite, and azurite for about 90 feet. The strike of the main slips is north and south (mag.) and of the minor, N. 38° W. (mag.). On the surface and in the open-cuts at the mouth of this tunnel the rocks are similarly mineralized over an area 50 feet square.

A shipment of 40 tons of sorted ore was packed out on horses to the wagon-road, hauled to Princeton, and transported by rail to the B.C. Copper Company's smelter at Greenwood in 1910. This car-load assayed: Gold, $2.80 to the ton; silver, 1.5 oz. to the ton; copper, 6.63 per cent. Another 25-foot tunnel has been driven about 800 feet up the hill to the south in a highly siliceous altered volcanic rock, in which the fractures are stained with malachite. About 300 feet in the same direction a 20-foot open-cut exposes the same mineralization. At this end of the claim there are numerous small pegmatite dykes that appear to be associated with the ore. The mineralized fracture-zones do not appear to have any relation to each other and occur as isolated segregations. Owing to the state of the workings it was difficult to establish any facts concerning these ore-bodies. The extent of the oxidized area surrounding the lower tunnel seems to warrant further exploration below. The claim is located on a very steep side-hill and tunnels can be driven that will make a depth of 1 to 1. The elevation of lowest workings is about 800 feet below the road.

SUMMIT CAMP, TULAMEEN.

Cascade Consolidated Silver Mining Co.

This company operated the *Mary E.*, *Dorothy*, *Hattie*, and *Vivian* claims on Treasure mountain, which are described in detail in the 1926 Annual Report. During the earlier months of the year a full force of men was employed on development and the lowest crosscut tunnel was driven to the downward extension of the vein, a distance of 1,258 feet from the tunnel portal. Drifts were driven both ways on this lead for a distance of about 300 feet. The width of the ledge-matter where intersected is 22 feet, consisting of disintegrated country-rock, calcite, and quartz. The ore, mainly zinc and pyrite, occurs in lenses on the foot and hanging walls, with stringers and specks throughout the gangue. A sample of this ore taken across 30 inches of vein material assayed: Gold, trace; silver, 0.20 oz. to the ton; lead, *nil;* zinc, 4 per cent. According to Henry Crowther, manager, better values were obtained from different parts of the vein in the north-east drift. A heavy flow of water was struck on the foot-wall of the main vein, which hampered development. At a distance of about 246 feet from the portal of this crosscut a vein 6 inches wide was struck, containing pyrite and sphalerite in a quartz and calcite filling. This lead was badly crushed and faulted and no drifting was done upon it.

Later in the spring, Rush Sills, mining engineer of California, examined the properties, and after a thorough sampling decided to stop all work except on the lower and upper tunnels. The force of men was cut down and a new mine foreman, J. Welch, put in charge. In July, when the property was visited, the lower tunnel was being driven, the upper tunnel crosscut cleaned out, and an upraise started on the ore developed in the drift. The company planned at that time to make a shipment of the galena ore from this tunnel. Apparently this was not done. Work on No. 2 tunnel consisted of short upraises on the ore-shoots to the north-east. No reliable data are obtainable regarding work from this time on.

The heavy snowfall which is usual in this locality hampered work of all kinds, especially hauling in gasoline and other supplies, and added very materially to the cost of operation. In the autumn all work ceased and a watchman was left to look after the buildings and supplies. The reason submitted for closing down operations was that further financing was necessary. Future plans have not been announced, but, it is understood, development capital may be secured in Europe.

The values found in the ore at depth (July 9th) were distinctly disappointing. Further work may uncover ore-bodies that contain a sufficient tonnage of silver-lead-zinc to warrant the installation of a concentration plant. At the time of examination this was not justified. The vein system in the lowest tunnel, approximately 1,000 feet below surface outcrops, was well defined and it seems probable that this condition will continue as long as the sedimentary rocks exist. Further exploration will prove whether there are better values at depth. The galena generally carries the high silver content and this mineral occurs in greater quantities in the upper levels. Development from the upper levels to the surface may be suggested as likely ground for future prospecting. A sample of ore from No. 2 tunnel, considered as likely mill-feed, assayed: Silver, 18 oz. to the ton; lead, 8 per cent.; zinc, 8 per cent.

Blue Bell.

This property, mentioned in the 1926 Annual Report, was also developed during the earlier months of 1927 by the Julian Merger Mines. A crosscut tunnel commenced in January was driven 204 feet to the intersection of the vein, which strikes south-west. A drift was driven on this vein for 102 feet and a crosscut from the intersection 75 feet in a southerly direction. The vein varies from 1 to 4 inches in width and contains small segregations of galena, sphalerite, and pyrite in a gangue of quartz. The elevation of this tunnel is about 130 feet below the upper workings and the vein has about the same strike. No samples were taken of the ore in the lower drift owing to the fact that it is chiefly unmineralized quartz and too narrow to be mined profitably. All work was discontinued on this property early in the year.

Nickel Plate.

This claim, adjoining the *Blue Bell* to the north-east, is owned by J. Thynne and E. B. Tingley, of Tulameen. Development, consisting of open-cuts and trenches on the extension of the *Blue Bell*, exposed an oxidized quartz vein from 2 to 6 inches wide, containing sphalerite, galena, pyrite, and marcasite. This ore occurred on the contact of the greenstones and argillites. Insufficient work had been done to prove the value of the find on this claim, and more development is suggested to the north-east and away from the present excavations, which are considerably disturbed by minor dyke intrusions.

**Queen Bess.** This group of claims, owned by A. Jensen, of Tulameen, lies to the south-west of the *Nickel Plate*. A series of quartz veins, varying from 2 to 36 inches in width and containing pyrite, sphalerite, and galena, have been uncovered in open-cuts, trenches, and shallow shafts over a distance of about 500 feet. Samples from these workings assayed as follows: Gold, trace; silver, 6.2 oz. to the ton; lead, 10 per cent.; zinc, 6 per cent.; and: Gold, trace; silver, 1 oz. to the ton; also: Gold, 0.04 oz. to the ton; silver, 13 oz. to the ton; lead, 6 per cent. Wherever the galena occurs higher silver values are obtained. The formations are similar to those found on Treasure mountain. More development on this mineralized area seems to be justified. There is a log cabin on the claim.

**Morning Star.** This claim, owned by Hugh Hunter, of Princeton, and located about a mile from Treasure mountain, near the headwaters of Sutter creek, has been bonded by Alec. Robinson, of Tulameen. There are no payments to be made except current taxes and 10 per cent. on any shipments made. At the time of examination new work consisted of an open-cut 12 by 8 feet on a faulted and oxidized mineralized zone showing two quartz stringers containing sphalerite, oxidized pyrite, and manganese. A sample of this vein-matter assayed: Gold, trace; silver, trace; zinc, 1 per cent.

Farther to the south-west and on the strike of the vein, development-work done many years ago consisted of an open-cut 25 feet long which uncovered a quartz vein containing galena, pyrite, and sphalerite varying from 2 to 6 inches in width, and a crosscut tunnel driven 25 feet lower in elevation for a distance of 75 feet. A drift has been driven from this tunnel for 93 feet on the downward extension of the vein found above and another tunnel 28 feet long from the south end of the drift. A shaft, supposed to be 28 feet deep, has been sunk on a quartz vein 14 inches wide at the end of the south crosscut. In the main drift the vein varies from a stringer to 6 inches in width in the back. On the floor under the loose filling there is about 10 inches of galena, which appears to be widening in depth. A picked sample of ore from the open-cut above the tunnel assayed: Gold, 0.04 oz. to the ton; silver, 75 oz. to the ton; lead, 42 per cent.; zinc, 8 per cent. The persistence of the vein material over a distance of 500 feet in the sedimentary rocks, and the possibility of being able to develop this vein on its strike at a depth of about 400 feet, seems to warrant further exploration.

**Hope Range Copper Co., Ltd.** This company was formed during the year with a capitalization of $1,000,000, divided into 1,000,000 shares of $1 each. The president of the company is Perley Russell, Princeton; vice-president, L. Marcotte, Coalmont; secretary, W. R. Foster, Coalmont; solicitor, A. S. Black, Princeton. A group of claims, consisting of the *Liverpool*, *Lone Star*, *Grand Trunk*, *Rambler*, *Air Line*, *Stonie Creek*, *Silver Queen*, *Prince of Wales*, *White Horse*, *Blue Bell*, *Radio*, and *Copper Chief*, and situated in the old Laws camp near Lawless creek, a tributary of the Tulameen river, has been acquired.

The *Liverpool* claim, on which most of the work has been done, is situated about 12 miles from Tulameen on the Kettle Valley Railway. An old wagon-road from Tulameen Station, 2,562 feet, crosses the summit at an elevation of 4,800 feet (bar.); drops down into Lawless creek, elevation 3,440 feet; and climbs into Laws camp, elevation 4,640 feet. These grades could be considerably improved by lengthening the road. At the present time the old route will answer the purpose of transporting supplies, etc., for preliminary development.

A résumé of work done on the *Liverpool* is as follows: Inclined 30° shaft 60 feet deep, a tunnel from collar of shaft 110 feet in length, and numerous open-cuts. From the foot-wall of the collar of the shaft to a point 66 feet within the tunnel the limestone and schist is almost entirely replaced by silica impregnated with pyrite, pyrrhotite, and chalcopyrite, with malachite in the fractures. The character of this ore appeared to be lower grade than that found in the bottom of the shaft, but a similar improvement in value at depth may be looked for. The dip of the schist and enfolded limesetone-beds varies from 30° to 40°. Owing to the heavy overburden of loam it is impossible to determine the width of the sedimentary rocks on their dip. As the ore-deposits are of a replacement character and lie almost entirely in the limestone and schist, and as nothing definite is known regarding the width of these beds, it will be necessary to do a considerable amount more stripping and trenching before any reliable estimate can be made of possible tonnage or values. When this work has been done the proper location for a diamond-drill can be determined. The comparatively flat dip of the schistose rocks into the hill necessitates long expensive crosscuts to the mineral-zone; whereas a diamond-drill hole driven at right angles to the formation from the top of the hill will locate any ore-bodies at a minimum expense.

At the present time the general mineralization throughout the schist, the improvement of values where developed at depth, abundance of timber for mining purposes, and sufficient water in Lawless creek for future needs make this prospect sufficiently attractive to warrant a small expenditure on further development under proper guidance.

*Placer-mining.*

There has been a distinct improvement in the placer-mining situation throughout the Tulameen and Similkameen River drainage areas, inasmuch that those intending to operate realize the absolute necessity of doing a considerable amount of preliminary investigation before purchasing a plant to treat the gravels. Numerous failures in the past have no doubt helped those now in the field, and it is a fairly well-established fact that the platinum and gold values are not generally distributed throughout the gravel-beds, but occur in well-defined channels. Ascertaining with reasonable safety the value to the cubic yard of gravel in a bench or stream-bed entails the expenditure of a large sum of money. Most of the shallow, easily operated placers have long ago been worked out and only the deeper-lying deposits are available for exploitation.

Inquiries from those conversant with electrical prospecting brought forth the opinion that this type of machine was not adaptable for exploring placer deposits owing to the fact that the gold and platinum were not sufficiently concentrated, as a rule, to give the necessary conductivity. The presence of magnetite which is generally associated with the Tulameen and Similkameen River gravels would also, where concentrated, register intense electrical activity whether or not there were any associated precious metals.

Extensive and constant high water hindered placer-mining to a great extent, especially in Granite creek and in the upper reaches of the Tulameen river. The spectacular find of platinum made again this year by Garnet Sootheran was not developed to any extent owing to the constant flooding of his workings.

The John Guest leases on the Tulameen river are well financed by private New York capital and are being properly exploited under competent management. It is probable that, if attractive values in gold and platinum to the cubic yard are found by preliminary investigations, a churn-drill will be installed.

Reliable figures on production from placer-mining are difficult to obtain owing to the fact that much of the precious metal is shipped directly out of the country by the small operator and other "clean-ups" are retained for exhibition purposes. Platinum received by the Royal Bank of Canada at Coalmont amounted to 14.560 oz. crude and 0.598 oz. gold. J. F. Jones and A. Gordon took out $120 in gold and $8 in platinum from Granite creek. Some large gold and platinum nuggets were found in a crevice by John Marks, of Tulameen. J. A. Schubert, storekeeper at Tulameen, bought 2 oz. of gold and 7.1 dwt. of platinum during the year. In 1928 higher production may be looked for, providing the Tulameen Gold and Platinum Recovery Company's electric shovel operates successfully on the Similkameen river.

**Sootheran Leases.** Another spectacular find of platinum was made on the Tulameen river during the summer by Garnet Sootheran and his partner, a short distance downstream from the spot where a discovery was made in 1926. Practically no work was done to prove the extent of this find owing chiefly to continued freshets which flooded the workings. Additional labour during the low-water season would go a long way towards proving whether these values are isolated segregations or an extensive bedded deposit underlying the old workings, which was left unworked owing to the low price of platinum in the early days.

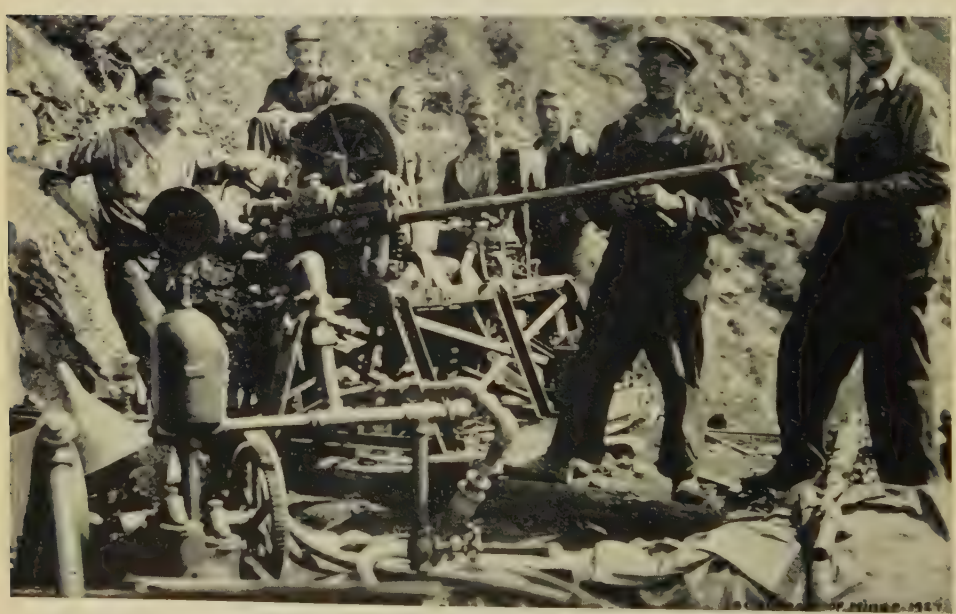
**John Marks Lease.** This lease, owned by John Marks, is located about 6½ miles up the Tulameen river from Tulameen village. A company named the Big Bend Platinum Gold Mining Company, Limited, has been formed under the managing direction of John Marks. During the winter months a camp will be built and water obtained for mining purposes from Haynes creek. For many years this lease has produced values during the high-water season, with insufficient equipment, to provide for J. Marks and family of four. On a lower lease some fine nuggets were creviced from the bottom of the Tulameen river.

**Slate Creek Leases.** Under the direction of Norman McCormick, of Princeton, development of the gravels near the falls on Slate creek and also tunnelling operations in the cut-bank below the mouth of the creek were carried on with a few men during the open season. Rock was struck in the cut-bank tunnel which had the

Tulameen River, Summit Camp.

Imperial Mine, Rock Creek, Greenwood M.D.

Fife Lime Quarry, Grand Forks M.D.



Wigwam Mine, Revelstoke M.D.—Diamond-drill.

appearance of the side-wall of a canyon. Advices from the management state that an effort would be made to discover another wall and then sinking operations would probably be undertaken. As stated in other annual reports, the cut-bank mentioned above is considered to be glacial drift deposited in the old mouth of Slate creek. Bed-rock at this point may contain deposits of gold and platinum which will be worth working. The operations at the falls on Slate creek were not visited, but it is understood some difficulty was experienced in breaking through the glacial clay lying near bed-rock.

**Tulameen Placer Mining Co., Ltd.**

This company was formed with an authorized capital of $500,000, divided into 500,000 shares of $1 each. The board of directors are Colonel R. D. Davies, J. McD. Grosart, A. E. Perman, L. J. Cooper, and J. P. Tait, of Vancouver, with registered offices at 615 Board of Trade Building, Vancouver. The prospectus states that ten leases—six creek and four bench leases—extending from the mouth of Slate creek down-stream (Tulameen river) to within 1½ miles from the village of Coalmont, having a total area of 488 acres, have been obtained. A camp had been built on a bench about a mile below Slate creek, but no other work had been done at the time of examination.

*Detailed Results of sampling Tulameen Gravels by Churn-drilling, Munitions Resources Commission, 1918.*

(Gold valued at $22.67 and platinum at $105 per troy ounce.)

| No. of Hole. | Depth of Gravel. | | Depth of Sample in Feet. | Gold from Assay of Sample. | Gold Value per Cubic Yard of Gravel represented by Sample. | Platinum from Assay of Sample. | Platinum Value per Cubic Yard of Gravel represented by Sample. | Total Gold and Platinum Value per Cubic Yard of Gravel for each Hole. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | Ft. | In. | From To | Milligrams. | Cents. | Milligrams. | Cents. | Cents. | |
| 1 | 70 | 5 | 0–50 | 5.37 | 7.13 | 8.35 | 5.62 | ..... | Bed-rock schist; |
| | | | 50–60 | 0.80 | 0.53 | 0.37 | 1.24 | 5.50 | depth, 69.8 feet. |
| | | | 60–70.5 | 1.40 | 0.88 | 1.38 | 4.44 | ..... | |
| 2 | 14 | 6 | 0–18.5 | 3.80 | 1.80 | 8.58 | 21.10 | 22.90 | Bed-rock, 18.5 feet. |
| 3 | 61 | 0 | 0–10 | 0.36 | 0.24 | 1.55 | 5.22 | ..... | No bed-rock. |
| | | | 10–20 | 1.41 | 0.93 | 0.85 | 2.86 | ..... | |
| | | | 20–30 | 0.36 | 0.24 | 0.18 | 0.60 | 1.98 | |
| | | | 30–40 | 0.32 | 0.21 | 0.18 | 0.60 | ..... | |
| | | | 40–50 | Trace | ..... | 0.03 | 0.10 | ..... | |
| | | | 50–61 | 0.02 | 0.01 | 0.34 | 1.14 | ..... | |
| 4 | 23 | 6 | 0–26 | 3.02 | 1.00 | 3.30 | 5.80 | 6.80 | Bed-rock, 26 feet. |
| 5 | 38 | 0 | 0–20 | 1.66 | 0.55 | 0.10 | 0.17 | ..... | Bed-rock, 45 feet. |
| | | | 20–30 | 94.58 | 62.84 | 0.04 | 0.13 | ..... | |
| | | | 30–40 | 1.52 | 1.01 | 0.28 | 0.94 | 14.50 | |
| | | | 40–45 | 0.08 | 0.11 | Trace | ..... | ..... | |
| 6 | 67 | 0 | 0–20 | 0.08 | 0.26 | 0.06 | 0.10 | ..... | Bed-rock, 72 feet. |
| | | | 20–30 | 0.86 | 0.57 | 0.07 | 0.23 | ..... | |
| | | | 30–40 | 0.96 | 0.63 | 1.60 | 5.39 | ..... | |
| | | | 40–50 | 5.80 | 3.85 | 3.46 | 11.66 | 6.70 | |
| | | | 50–60 | 0.42 | 0.28 | 0.07 | 0.23 | ..... | |
| | | | 60–67 | 1.56 | 1.48 | 7.30 | 24.60 | ..... | |
| 7 | 50 | 0 | 0–10 | 0.10 | 0.07 | 0.20 | 0.67 | ..... | No bed-rock. |
| | | | 10–20 | 0.12 | 0.08 | 0.28 | 0.94 | ..... | |
| | | | 20–30 | 0.16 | 0.11 | 0.14 | 0.47 | 0.80 | |
| | | | 30–40 | 0.04 | 0.03 | 0.16 | 0.53 | ..... | |
| | | | 40–50 | 0.06 | 0.04 | 0.36 | 1.21 | ..... | |
| 8 | 59 | 0 | 0–55.5 | 0.47 | 0.01 | 3.03 | 1.84 | ..... | No bed-rock. |
| | | | 55.5–59 | 1.36 | 3.49 | 0.02 | 0.26 | 2.72 | |
| 9 | 48 | 0 | 0–20 | 0.96 | 0.318 | 0.94 | 1.58 | ..... | Bed-rock, 48 feet. |
| | | | 20–30 | 0.72 | 0.47 | 0.17 | 0.57 | ..... | |
| | | | 30–40 | 0.12 | 0.08 | 0.04 | 0.13 | 1.47 | |
| | | | 40–48 | 0.20 | 1.66 | 0.60 | 0.25 | ..... | |
| 10 | 46 | 0 | 0–20 | 19.25 | 6.39 | 1.22 | 2.05 | ..... | No bed-rock. |
| | | | 20–30 | 0.16 | 0.11 | 0.06 | 0.20 | 3.44 | |
| | | | 30–46 | 0.06 | 0.24 | Trace | ..... | ..... | |
| 11 | 7 | 0 | 0–7 | Trace | ..... | 0.10 | 0.48 | 0.30 | No bed-rock. |

Pannings of the gravel on some of the benches showed attractive colours in gold and platinum, but as this is no criterion of pay-gravel beneath in this area, further preliminary testing will have to be done before expensive machinery is installed. The location of these claims, just below the chief tributaries of the Tulameen River area that cut through the platinum-bearing rocks, is attractive. Only the shallow diggings up-stream could be worked in the early days and much gold and platinum was recovered by crude means; the deeper channels have never been worked. Churn-drilling was done by the Munition Resources Commission in 1918 on the opposite side of the river and the results are shown on preceding page. At the time of this drilling gold was valued at $22.67 and platinum at $105 a troy ounce. Refined platinum is now worth about $65 an ounce. Only a small part of the ground was covered and consequently nothing definite can be stated regarding the value of the ground for dredging operations on a large scale. The drilling was done to discover whether the ground was sufficiently rich throughout to warrant the construction of a dredge costing at that time probably $250,000. The Tulameen Placer Mining Company expects to excavate its ground with a shovel, either steam or electric, which will cost them, according to size, between $20,000 and $50,000. This type of machine is not only much cheaper, but it can be very easily moved, and for comparatively narrow-channel work is preferable. The chief obstacle appears to be the disposition of the tailings in a deep channel.

**John Guest Leases.** These leases, twelve in number, are located about 2 miles south-east of Coalmont, adjoining the Tulameen river. Seven of these are staked along the river-front and five on the benches behind. An arrangement has been made between J. Guest and certain capital interests in New York to prospect this ground, and if satisfactory values are found steps will be taken to install machinery and work the gravels.

Ground-testing on Lot 1877 up to October 19th amounted to a shaft about 35 feet deep on a bench 25 feet above and 100 feet south of the Kettle Valley Railway, and another shaft 18 feet deep about 100 feet farther south. An open-cut about 10 feet square along the Tulameen River bank and about 300 feet north-west of the other workings had also been started. Pannings from these shafts were examined and, although values to the cubic yard had not been figured at that time, the gold and platinum contents will probably run high. Some of the bench leases staked in this area take in possible high channels running from the vicinity of Granite creek towards the Tulameen river in a north-easterly direction. Good surface values have been panned from these gravels and further exploration at depth seems justified. The road traverses the north bank of the river within half a mile of the leases and the railway passes through Lot 1877. F. E. Wormser, of New York, is consulting mining engineer for the New York interests.

**Ruby Lease.** This lease, mentioned in the 1926 Annual Report, was worked by K. Ruby and partner, of Coalmont. The ground covers one of the proven high channels that produced much gold in the past. Insufficient capital to install proper working machinery and water-storage above has been the reason of low production.

### Granite Creek.

**A. Gordon Lease.** This lease (formerly the Lambert) was operated by Andrew Gordon and J. F. Jones, of Coalmont, and was mentioned in the 1926 Annual Report. The old 330-foot tunnel flume was cleaned out and the 1,100-foot bed-rock flume extended into virgin ground below the dam. Continued freshets hampered operations to such an extent that practically the whole season was lost. A total of $120 in gold and $8 in platinum was taken out.

**Tulameen Gold and Platinum Recovery Co., Ltd.** This company's operations were mentioned in the 1926 Annual Report, page 232. Work continued on the supposed old high channel between the Tulameen and Similkameen rivers and the original shaft sunk to bed-rock, which was found to slope in a north-easterly direction, according to advice received. Another shaft was commenced to the north-east and sunk over 200 feet in depth. According to the management, values in gold and platinum were panned from this shaft from time to time, but they did not expect any concentration of metal until bed-rock was reached. Preliminary investigations were continued in the Similkameen River leases and a Marion ¾-yard gasoline-driven shovel was purchased, but was delivered too late in the season to be available for excavation-work on the lower bench leases. This machine was used to widen

the road down to the river so that it could pass, and to dig a small pit so that operations could commence without delay in the spring. A follower was designed and built at Princeton and constructed to carry a small bin, grizzly, sluice-boxes, and belt-conveyor to carry off the tailings. After this contrivance was built it was dismantled and transported to the leases, about 6 miles up the river. One of the chief difficulties found in the operation of a follower of this kind is the disposal of the tailings where deep channels are worked, and to overcome this the dump-conveyor must have lateral as well as longitudinal play.

## Coal.

The lignite-coal industry in the Princeton basin received a distinct impetus during the year with the advent of outside capital. Since the closing-down of the Princeton Coal and Land Company over a year ago, the only producer of this class of coal was Chas. Hunter, who is operating within a mile of Princeton. The seams lately developed in this area appear to be wide and clean, and if the all-essential summer market for the coal can be maintained there is no reason why this industry, under competent management, cannot be made to pay profits to the operator. The chief hindrance formerly was the lack of domestic demand for this coal during the warm weather and the difficulty of sustaining a clean product, due possibly to inefficient washing-machinery. Occasionally mud-seams and "bone" are struck in the mines and this material must be removed before shipping, or the market will be lost.

### *Lynden Coal Mines, Ltd.*

This company, comprised mainly of American capital with offices in Princeton, B.C., has been operating Lease No. 962, near 9-Mile bridge south of Princeton. Recent developments constitute a slope averaging 8° driven 327 feet in depth on a seam varying from 9 to 11 feet in width and three levels driven from this slope; one, 200 feet at station 82.4 feet from the mouth; another, 180 feet from station 172.7; and the third 100 feet from station 258.1 in an easterly direction. From the last two levels counter-slopes are being driven. A hoist-house, compressor-house, repair-shop, store-room, bunk-houses, kitchen, coal-chute, and screens have been built and machinery installed. A road has been built three-quarters of a mile long to connect the main workings with the Princeton–9-Mile road. Late in the year active operations commenced, and coal was transported by two Gotfredson trucks of 3- and 4-ton capacity, one Day-Elder 5-ton truck, and two 2-ton Dodge trucks a distance of 9¾ miles to the railway at Princeton. About 75 tons every twenty-four hours is being mined and shipped by these trucks working day and night. Most of the coal, it appears, has been marketed in British Columbia.

The coal-seam being worked strikes in an easterly and westerly direction and dips to the north from 7° to 9°. When an all-the-year market is established and sufficient tonnage blocked out, the company will be in a position to request an extension of the railways which terminate at Princeton. This will do away with the high cost of truck-hauling over roads not built to withstand extraordinarily heavy traffic.

# EASTERN MINERAL SURVEY DISTRICT (No. 5).

By A. G. Langley, Resident Mining Engineer.
(Reports marked * are by B. T. O'Grady, Assistant.)

## INTRODUCTORY.

The district comprises the Revelstoke, Lardeau, Trout Lake, Slocan, Slocan City, Ainsworth, Nelson, Trail Creek, Arrow Lake, Golden, Windermere, and Fort Steele Mining Divisions. During the year the bulk of mining operations, as usual, were confined to silver-lead-zinc ore-deposits. Headed by the *Sullivan*, the shipping-list includes about sixty names.

The value of the metal production from the independent or customs shippers will be less than that of last year, partly owing to the decline in metal prices and partly to the fact that some of the leading producers slackened up shipments pending the completion of their own concentrators. The *Sullivan* production, however, was increased to 4,000 tons a day, which materially helps to make up for deficiencies from other sources and to establish a new record for the tonnage treated at the Trail smelter.

### Progress during the Year.

In spite of the decline in metal prices there has been marked progress in mining and development activities during the year throughout the district, with results that signify a substantial increase in future production. This augurs well for the continuance of the splendid record of the industry's advancement during recent years for an indefinite period.

### Construction-work.

An outstanding feature of the year is the amount of new construction-work that has been undertaken in various parts of the district, notably in the Slocan.

Benefiting by the improved marketing conditions afforded by the acceptance of complex ores for concentration by the Consolidated Mining and Smelting Company, a number of companies have been enabled to carry on development and block out sufficient tonnage to warrant the erection of their own concentrators. By doing this it is estimated a considerable saving can be made in the cost of production. At the *Whitewater*, *Lucky Jim*, and *Ruth-Hope* new mills embodying the latest flotation flow-sheets were nearing completion at the end of the year, while the *Hewitt* mill has been remodelled to treat the ores of the *Carnation* and *Hewitt*. A new aerial tramway has been built from the former of these two properties to the *Hewitt* mill.

In the East Kootenay a 50-ton concentrator was constructed at the *Paradise*, and in the Nelson Division small mills are being erected at the *Second Relief* and *Arlington* near Erie. On the Kootenay river, near South Slocan, the West Kootenay Power and Light Company is making good progress with the immense undertaking of constructing a new hydro-electric power plant, at which an additional 60,000 horse-power will be developed. This power, which will be used by the Consolidated Mining and Smelting Company, indicates the rapid progress being made by this company.

In the Lardeau Division construction was commenced on a pole-line to transmit power from a proposed plant on Menhennick creek to the *Teddy Glacier;* this line will be about 7½ miles long over rugged mountain country.

### New Developments.

Among the independent mines at which developments have taken place during the year that would appear to have an important bearing on future production, the following may be mentioned: *Whitewater*, *Lucky Jim*, *Ruth-Hope*, *Hewitt-Carnation*, *Cork-Province*, *Paradise*, and *Yankee Girl*. Besides these there are a number of others in various stages of development with good prospects for future production.

### Exploration.

Exploration by diamond-drilling and otherwise has been carried on quite extensively during the year. The Consolidated Mining and Smelting Company, which is reported to be drilling the *Estella* in the Fort Steele Mining Division, also did some drilling at the *Eclipse* in the Lardeau Division and at various properties in the Nelson Division.

The Victoria Syndicate has done extensive exploration by diamond-drilling and tunnelling in the Pend d'Oreille area of the Nelson Division and a considerable amount of underground work in the Slocan. Drilling in the Kimberley area was continued by R. M. Bennett and associates, of Detroit, and by the Western Exploration Company.

At the *Big Ledge*, near Nakusp, American interests did a considerable amount of drilling; the *Wigwam* group near Revelstoke was also subjected to an extensive diamond-drilling campaign by Tacoma interests.

### Geological Survey Work.

The Geological Survey of Canada had two parties in the field in the West Kootenay, one under C. E. Cairnes in the Slocan and the other under J. F. Walker in the Lardeau, while C. S. Evans was working in the Golden Division.

A notable event was the visit of the Empire Mining Congress to the district early in September. After spending a day at Fernie the Congress visited the *Sullivan* mine and concentrator, where a most interesting day was spent. On the following day the two special trains left for Kootenay Landing, whence an enjoyable excursion was made up Kootenay lake to the *Bluebell* and then on to Nelson. After visiting the plant of the West Kootenay Power and Light Company at Bonnington Falls the party returned to their trains at Nelson for the night. The next morning was spent at the Trail reduction-works and after a luncheon provided by the Consolidated Mining and Smelting Company the two specials pulled out for the next point of interest, which was the *Allenby* mine of the Granby Consolidated Mining, Smelting, and Power Company.

The writer wishes to acknowledge with many thanks the courtesies extended by the mine-owners and prospectors during his travels in the district, also his appreciation of the co-operation received from members of the Geological Survey of Canada.

## GOLDEN MINING DIVISION.

Mining activities in this Division were principally confined to the area tributary to the Spillimacheen river in the Purcell range, where development and exploration work undertaken at the *Giant* and *Ruth-Vermont* properties give rise to hopes that production may be expected within the not-far-distant future. It is too early to make definite statements, but if the results of further development come up to expectations a great deal more activity will be evidenced and the attention of mining men will be attracted to this section of the country, in which a number of claims await exploration.

List of Producing Mines in the Golden Mining Division, 1927.

| Mine. | Locality. | Tons. | Character of Ore. |
|---|---|---|---|
| Anderson, L. E. | Kaslo | 1 | Gold. |
| Ruth-Vermont | Golden | 5 | Silver-lead-zinc-gold. |

In the past prospecting and mining operations in the mineralized zone, which lies some 20 or 30 miles to the west of the Columbia river, has been greatly handicapped by lack of transportation facilities. Supplies had to be packed in over steep and tortuous trails and ore had to be packed out, but now that a road has been constructed up Spillimacheen river to Vermont creek a large area of mineralized country is brought within comparatively easy reach of the railway. This route provides a means of establishing at no very great cost an easy and uniform grade which can gradually be converted into a good trunk road for motor-haulage, with branches extending up the main valley, should ore in sufficient quantity be developed to warrant the additional cost of improvements and construction.

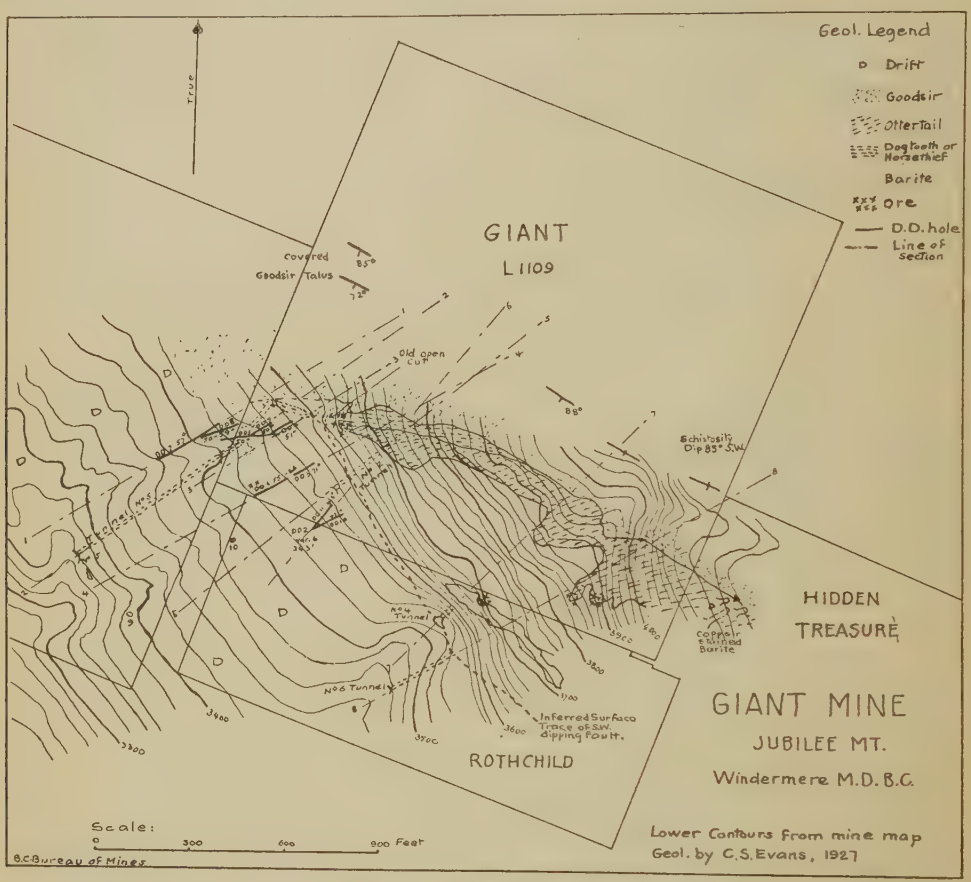
Although the area traversed by the road has not yet been covered by the Geological Survey of Canada, it is logical to assume that it is underlain by the rocks of the Windermere series, as great masses of pebble conglomerate similar to that of the Horsethief series outcrop near Farnham creek, indicating the northerly extension of the Mount Nelson formation near the head of Vermont creek. It is in this formation most of the ore-deposits in the Windermere area occur.

**Giant.** Situated on the Spillimacheen river at a distance of about 7 miles by road from the railway at Spillimacheen. During the last two years exploration by diamond-drilling and otherwise has thrown a good deal more light on the

character of this deposit than was previously possible to ascertain. During the year the property was examined by Charles S. Evans, of the Geological Survey of Canada, from whose report the following geological information is quoted in part:—

"The major structure of Jubilee mountain is a north-west pitching syncline, of which the Western limb is the steeper. This structure is cut along the Western base of Jubilee mountain by a major thrust-fault that brings the late Pre-Cambrian strata (here Horsethief or Dogtooth at mine) against the various members of the syncline, whose members it truncates obliquely. The strike of the Ottertail and Goodsir of the Western limb at and near the *Giant* lies between 290° and 300° with steep dips. The strike of the Pre-Cambrian lies between 315° and 320°.

"The Ottertail limestone of lower Upper Cambrian age is usually fine-grained, light-weathering, light-grey siliceous dolomitic limestone. . . . It forms the favourable host for baryte, which in turn is the host for the lead ore."




In general this mineral occurs in this limestone not far from the Goodsir-Ottertail contact, where it forms bedding and irregular replacements along fractures within several hundred feet of the contact.

Briefly, the old workings consisted of a deep open-cut from which the ore was quarried and three tunnels, the lowest or No. 3 gaining a depth of approximately 130 feet below the open-cut. When visited in May the new underground development consisted of a crosscut 640 feet in length driven under the No. 3 level. This intersected the ore at a distance of 640 feet from the portal, at which point a raise had been driven to connect with the No. 3 level, 220 feet above. At the point of intersection the crosscut showed a width of about 12 feet of milling-grade ore, which is continuous for the length of the raise, but varying in thickness and grade. The average of the ore extracted from these workings was said to run: Lead, 12 per cent.; silver, 3 to 4 oz. to the ton. In the old No. 1 tunnel, which is situated at a vertical height of about 330 feet above

and 300 feet to the east of the crosscut, the ore shows a width of about 18 feet, so there was, apparently, a good chance for the development of an ore-shoot of considerable dimensions between these two workings, with possibilities for its extension in an easterly direction for about 500 feet, judging by surface indications. To prove its continuation in this direction a crosscut tunnel was being driven on the *Rothchild* at a distance of about 800 feet to the east of the crosscut. The indications were considered favourable for the downward continuation of the ore below the present lowest level.

Milling tests made on the ore demonstrate that it responds favourably to separation by oil-flotation; the recovery obtained being as high as 99.4 per cent. of the lead and 90.6 per cent. of the silver. As a by-product, barytes could be saved by table separation of the flotation concentrates, yielding about 25 tons of barytes to 100 tons of ore. The high specific gravity of the barytes which forms the gangue is an important factor in favour of low mining and milling costs.

The property is equipped with good cabins for the accommodation of about twenty men and a small power plant consisting of a 25-horse-power Fairbanks-Morse oil-engine and an Ingersoll-Rand compressor. The total operating cost to the foot advance is given as $20.30. For further reference *see* Annual Report for 1923.

**Ruth-Vermont.**

Situated near the head of Vermont creek at a distance of about 35 miles from Spillimacheen, on the Kootenay Central Railway. The property was acquired by the Galena Syndicate, of London, last year. G. W. Edwards, whose address is Golden, B.C., is their local representative and manager. Soon after operations were started it was realized that lack of transportation facilities was a decided handicap to any substantial progress being made in the development of this property, while the shipment of any high-grade ore which might be won in the process of development was not practical under existing conditions; so it was decided to construct a road from the end of the old logging-road up Bobbie Burns creek. Crossing the Powell near its confluence, the road follows the valley of the latter to Vermont creek and thence to the mine. This was quite an undertaking, for it meant the reconditioning of about 10 to 15 miles of the old logging-road and 10 miles of new construction. Besides greatly facilitating mining operations at the property, the road will be of great benefit to prospectors in the surrounding country.

Since visiting the property last year, work at the mine has been principally confined to the development of the ore exposed in the old Nelson tunnel. Here the formation consists of thinly bedded argillites striking N. 40° W. and dipping at 43° to the north-east. The occurrence of pebble conglomerates at no great distance from the mine would indicate that these rocks belong to Mount Nelson formation of the Windermere series, in which many deposits have been found to occur in the Windermere Mining Division. The development so far accomplished has disclosed the ore to occur in a mineralized zone, apparently 30 to 50 feet wide, conforming to the dip and strike of the formation. In this zone the mineral-bearing solutions have apparently followed the lines of least resistance by replacing the more readily soluble beds, with the result that sulphide ore has been deposited in parallel bands and streaks separated by bands of sparsely mineralized country-rock.

The old Nelson tunnel, which has been driven into the face of a bluff some 900 feet above the creek, had been advanced to a total length of 50 feet and lay for most of this distance in the foot-wall side of the ore. At 25 feet from its portal a short crosscut driven to the foot of a raise exposes a width of 4 feet of massive sulphide ore similar in character to that sampled last year, which gave the following returns: Gold, 0.02 oz. to the ton; silver, 26.01 oz. to the ton; lead, 24.8 per cent.; zinc, 25.7 per cent.

A 50-foot raise connects this tunnel with an upper tunnel which had been driven for 30 feet on a parallel band of ore, with fairly heavy sulphide mineralization in either wall. The best grade of ore was apparently confined to a width of about 30 inches, across which a sample gave the following returns: Gold, 0.03 oz. to the ton; silver, 12.4 oz. to the ton; lead, 14.3 per cent.; zinc, 20.6 per cent. Besides this there were evidently good possibilities for mining a considerable quantity of lower-grade mill-feed. Above this tunnel ore had been stoped from a small cross-fissure.

On other parts of the property a considerable amount of development and prospecting work has been done on a series of small fissure-veins which cut the formation and from which some high-grade ore has been extracted. Judging by the character and extent of mineralization, the

possibilities for the development of important ore-bodies would appear to fully warrant gradual and systematic exploration of the property with a view to blocking out sufficient tonnage to warrant its equipment for production, which it is understood is the intention of the management.

Mining activities at the *Monarch* and *Kicking Horse* at Field were temporarily suspended, pending arrangements being made for additional capital to place them on a producing basis.

### Placer-mining.

Small-scale hydraulicking operations were carried on during the year on Quartz creek, near Beavermouth, by the Quartz Creek Syndicate. Results of the work are not known at the time of writing. Reference to the property may be seen in the 1926 Annual Report.

## WINDERMERE MINING DIVISION.

The operation of the *Paradise* by the Victoria Syndicate will undoubtedly stimulate mining activities in this Division and possibly lead to other important operations. While there is ample evidence of a mineralized zone covering a large area of rugged mountain country, its economic importance cannot be fully appreciated until more systematic exploration of the numerous prospects has been undertaken, which necessarily requires the expenditure of a considerable amount of capital before returns can be expected. Excellent work has been done in recent years by the Geological Survey of Canada in this Division, and J. F. Walker's report with its accompanying map is a most useful guide for the prospector and field engineer.

**Paradise.** Since this property was acquired by the Victoria Syndicate its development has been aggressively proceeded with under the direction of R. H. Stewart. As a preliminary step a detailed geological survey of the mine-workings was made by J. J. O'Neill. During the summer it was considered that the ore blocked out, together with the favourable possibilities disclosed by development, justified the erection of a concentrator at the mine of a rated daily capacity of 50 tons. This meant the haulage of all the building material, machinery, and equipment for a distance of 18 miles from Invermere through a vertical distance of 5,000 feet. This was accomplished by means of motor-trucks to the foot of the mine road and thence by two caterpillar tractors to the mine.

The plant, which is expected to be in operation during the early part of 1928, is designed for oil-flotation, and its equipment will include, besides the usual coarse-crushing machinery, a ball-mill, Dorr classifier, M.S. flotation-cells, American filter, and necessary accessories.

The new underground work undertaken by the Victoria Syndicate has been confined chiefly to the body of sulphide ore first exposed in an intermediate level 90 feet above the low adit-tunnel, or what is now called the 7,800-foot level, so designated on account of its elevation above sea-level. The approximate length of this sulphide ore-body on the intermediate is 350 feet, with an average width of 10 feet. In order to prospect its downward continuation the 7,800-foot level was advanced to a point below the strongest ore-exposures. Disappointment was manifest when no ore was encountered at this point. However, a careful study of the structural conditions revealed the fact that the ore occurrence was controlled by the folding of the strata and that this particular ore-body lay in a transverse fold which raked to the west or into the hill at an angle of about 20°, and its downward continuation was finally intersected by the further advancement of the 7,800-foot level.

It is logical to assume that further exploration may reveal a repetition of these foldings. The mineral-bearing solutions have apparently replaced a thin band of limestone and have been controlled to a certain extent by a narrow band of slate under which the ore has been found to occur. During construction seventy-five men were employed, but when the mine is on a producing basis a crew of about forty-five men will probably be sufficient.

**Grotto.** The mine-workings are situated near the base of Starbird ridge at an approximate distance of 15 miles by road from Wilmer. The formation underlying the area which has been prospected consists of limestones and quartzites of the Beaverfoot and Brisco series of the Palæozoic era. The results of the earlier attempts to prospect surface showings of iron-stained ledge-matter finally revealed the presence of a large cave in the limestones; hence the name, *Grotto*.

In the bottom of this cave a small pocket of galena and some low-grade carbonates were exposed. To prospect this ground a 190-foot crosscut was driven and some 50 feet of drifting done, but without obtaining any conclusive results. Under the direction of R. A. Ballentine

Phosphate Quarry, Crowsnest, Fort Steele M.D.

Phosphate Quarry, Lizard Creek, Fort Steele M.D.

Elk River—Power Plant at Falls.

Bull River Power Plant.

further exploration was undertaken, which chiefly consisted of putting in a number of short diamond-drill holes. These failed to prove the presence of any commercial ore-body and demonstrated that the ground was shattered and greatly disturbed, indicating that this section of the hill was not in place.

Other prospecting done at a distance of some 1,800 feet to the west of these workings disclosed the presence of a vertical sheared fracture, the filling of which, consisting of broken country-rock and some quartz, was slightly mineralized with galena across a width of 6 feet or more. A sample taken across a width of 2 feet, which appeared to be the most highly mineralized section, gave the following returns: Gold, 0.02 oz. to the ton; silver, 2.7 oz. to the ton; lead, 4.7 per cent.; zinc, 0.7 per cent.

The camp buildings are nicely situated and provide good accommodation for a crew of about thirty men. The mine is equipped with a 40-horse-power Fairbanks-Morse oil-engine and a single-cylinder 10- by 12-inch Canadian Ingersoll-Rand compressor No. 5372.

**Lead Queen.** At this mine development-work was continued during the year with a crew of eight or ten men under the direction of F. M. Simonds. During the earlier part of the year the upper tunnel was advanced for 148 feet and 45 tons of silver-lead ore taken out in the course of development was shipped to Trail. Latterly work was confined to the advancement of the old low tunnel in order to gain a depth of 500 feet below the ore exposed in the upper workings. Here 150 feet of drifting was accomplished; new track, ventilation-pipe, and a 3-horse-power gasoline-engine and blower were installed. Other improvements consisted of a new blacksmith-shop and bunk-house with accommodation for twelve men. Work has been suspended for the winter, but will be resumed next spring.

**Nip & Tuck.** This group—consisting of the following claims: *Nip & Tuck, Silver Tip, Mohawk, Silver Bell, Nip & Tuck Fraction,* and *Mountain Lookout*—is now owned by the Trethwood Mining Company, Limited, of Vancouver. A contract was let for driving a 600-foot crosscut last July, the objective being to tap the vein system at depth. This work is being continued through the winter. A compressor and oil-engine have been installed and a new camp built. The property is situated at the head of McDonald creek and is referred to in the Annual Reports for 1920 and 1922.

On Slade creek prospecting is reported to have been done at the *Pretty Girl, White Cat,* and *Relief.*

On Delphine creek the *Outcrop* and *Outlet* claims were operated in a small way by W. V. Sommerville. On Toby creek work was resumed by the owner, Murdock McLeod, on the *Silver Spray;* satisfactory results are reported. A few men were also engaged at the *Black Diamond.*

**Hart.** This property, belonging to Tom Hart, of Brisco, comprises a group of seven claims and is situated at a distance of approximately 4 miles from Brisco and about 1½ miles west of the Columbia river. Prospecting has been confined to a belt of dark dolomitic limestones, probably belonging to the Ottertail series of the Upper Cambrian. Work done on an exposure in the steep side of a narrow canyon, through which Templeton creek flows, has disclosed crushed limestone in a sheared and sheeted zone. In this formation a tunnel has been driven in a direction of N. 60° E. for 40 feet, in which length a pocket of ore was encountered near the portal. The ore, consisting of finely crystalline galena, occurred as impregnations in the limestone and was deceptive to the eye, for according to assay returns of the sample taken it yielded more lead than one would suppose. The assay returns were as follows: Gold, 0.02 oz. to the ton; silver, 1.4 oz. to the ton; lead, 18.9 per cent.; zinc, 3.7 per cent.

A considerable amount of asbestiform material occurs along the cleavage-planes and sheared fractures of this limestone. As yet insufficient prospecting has been done to allow an opinion to be formed as regards the merits of this property.

List of Producing Mines, showing Tonnage shipped.

| Mine. | Locality. | Tons. | Character of Shipment. |
|---|---|---|---|
| Lead Queen | Brisco | 45 | Silver-lead-zinc ore. |
| Paradise | Invermere | 54 | Silver-lead-zinc ore. |
| B.C. & Tilbury | Invermere | 11 | Silver-lead-zinc ore. |

## FORT STEELE MINING DIVISION.

**Consolidated Mining and Smelting Co.**

At the *Sullivan* the rate of production was increased to 4,000 tons a day during the latter part of the year to meet the added capacity of the concentrator. In the old upper workings preparations were being made to salvage the remaining ore before abandonment, it being the intention to conduct all mining operations from the 3,900-foot level. The mining and the development of the immense ore-bodies were continued during the year with satisfactory results. The underground equipment has been steadily brought up to a high state of efficiency and permanency. A considerable amount of exploration-work was also done on some of the outlying claims. A total of about 800 men was employed by the company at the mine and concentrator.

At Moyie the 500-ton concentrator was operated during the year on the tailings of the old *St. Eugene* mill. A coarse-crushing plant was added to its equipment, which it is understood will be used for the treatment of ore from the old mine-dumps.

The *Estella*, near Wasa, which was first opened up in the nineties and for many years has lain idle, was acquired by the company and is now being diamond-drilled. It is understood that the company continued exploration-work on the phosphate-beds near Michel.

Among activities in the Kimberley area, diamond-drilling and exploration-work were undertaken by the Western Exploration Company, under the direction of R. A. Grimes, on a group of claims adjoining the *Sullivan* group to the north-west and on a group to the east and south by R. M. Bennett and associates, of Detroit.

The *Aurora*, which was operated during the early part of the year, was later closed down owing to lack of capital for development. Shipments for the year totalled 521 tons of milling-grade silver-lead-zinc ore.

The *Guindon* group, which adjoins the *Aurora*, was operated by Frank Guindon, of Moyie. A short stretch of road was constructed and 21 tons of silver-lead-zinc ore was shipped to Trail.

**B. & V.**

This group, consisting of thirteen claims, is situated a few miles to the south-west of Cranbrook and at a distance of about 3½ miles by road to the west of the railway. The property belongs to A. Van Arsdalen and B. Frisinia, of Cranbrook. The area covers a low rounded ridge and is underlain by flat-dipping quartzites of the Aldridge formation, which have been disturbed and broken by igneous intrusions of the Purcell sills. Over this area a considerable amount of prospecting has been accomplished by open-cuts and shallow shafts; while as yet indefinite, the results indicate possibilities for further prospecting.

**Viking.**

Situated on Little Sand creek at a short distance from the end of the wagon-road. The property, consisting of six claims, is owned by Bert Matson and associates, of Cranbrook. The formation consists of flatly dipping slates and quartzites, in which a vertical quartz-filled fissure has been prospected by 160 feet of drifting. A little mineralization was in evidence where cross-fracturing occurred, but as the work done in the tunnel had not come up to expectations the owners intended doing surface prospecting on some interesting showings said to be exposed higher up the mountain.

Work was also continued at the *Great Western* group on Little Sand creek by A. Benson and associates.

**Olivia.**

This property, consisting of two claims—the *Olivia* and *Black Snake*—is situated on the east side of Wildhorse creek and at a distance of about 10 miles from Fort Steele. It is owned by O. Holm and J. B. Casey, of Wardner. Several short tunnels have been driven to prospect a quartz vein carrying small values in copper. The vein lies in a slate formation, its strike and dip being indefinite owing to crushed and disturbed conditions, indicating surface movement which had not been penetrated by the work so far done.

The upper tunnel has been driven into the side-hill for 18 feet and exposes a good width of sheared quartz, while in the other tunnel 100 feet lower down a little low-grade ore was encountered, judging by a small pile on the dump. This tunnel had caved in at the portal and could not be examined. A sample taken from the dump gave the following returns: Gold, 0.03 oz. to the ton; silver, 0.7 oz. to the ton; copper, 1.01 per cent.

**Khedive.**

This group, consisting of the *Khedive*, *Sirdar*, and *Silver Chief* claims, is owned by A. B. Fenwick, of Bull River, and is situated on the northerly side of the river at a distance of approximately 6 miles from the railway. Work

done on this and other properties along the steep hillside on the westerly side of the river has disclosed the presence of a sheared fracture along the contact of a diorite dyke and quartzites. Small lenses of ore have been encountered at numerous points along its strike; the mineralization, apparently favouring the diorite, varies in character, in places being principally in copper and in others silver-lead-zinc.

On this particular property the fracture has been traced for over 1,000 feet in an east-west direction. Surface work suggests the presence of two veins at about 50 feet apart and a crosscut tunnel was being driven to prove this theory. This was in about 130 feet and had a few more feet to go to reach its objective.

The showing which appealed to the writer as being the most interesting was located at 700 feet to the west of this tunnel, where an open-cut exposed a width of about 4 feet to be well mineralized with galena in a siliceous gangue. A sample taken across 3 feet gave the following returns: Gold, 0.02 oz. to the ton; silver, 6.2 oz. to the ton; lead, 18.1 per cent.; zinc, 1.8 per cent. This was a new discovery and only a small portion of the vein had been exposed, which made it difficult to arrive at conclusions regarding the possibilities, except that they appeared to be sufficiently encouraging to warrant more work being done.

**Pay Roll.**

Situated on Nigger creek at a distance of approximately 4 miles by road from Lumberton. This property, which has lain idle for many years, was further explored during the year by Morris Quain and associates, of Cranbrook. The only reference which can be found in previous Annual Reports is a short description by the Provincial Mineralogist in 1898, although since then it was evident that more work had been done. Prospecting has been confined to quartz veins which cut flat-dipping Aldridge quartzites and a considerable amount of tunnelling has been accomplished. Small knolls and rugged gulches are characteristic topographical features. Unfortunately there was no one at the mine when visited, and as time was limited a thorough examination was not attempted; only recent work was inspected with a view to determining whether or not conditions warranted the old road being opened for the transportation of ore. The work being done comprised a short length of tunnel driven on a narrow quartz vein which, striking east and west, intersected a small knoll of quartzite and closely followed a small basic dyke. A sample taken at the face of the tunnel assayed: Gold, 0.06 oz. to the ton; silver, 0.6 oz. to the ton; and a grab sample from about 30 sacks of sorted ore returned: Gold, 0.41 oz. to the ton; silver, 0.6 oz. to the ton.

Among the numerous other activities the following have been reported: In the St. Mary Lake area at the *Boy Scout* group a low crosscut some 500 feet long intersected the vein at an additional depth of about 200 feet. There is said to be a good width of milling grade exposed at the point of intersection. The property belongs to A. H. Mayland, of Calgary, and N. A. Wallinger, of Cranbrook.

J. Angus put in a season at his claims on Hellroaring creek and Evans Bros. on the *Evans* on Whitefish creek. This latter is a copper property and is referred to in previous Annual Reports.

Further work was done at the *Mystery* by the owner, R. Dewar. This is also a copper property on which a considerable amount of useful prospecting-work has been accomplished. It is situated on Alki creek at a short distance from the St. Mary Lake road.

In the vicinity of Skookumchuck further work was done by Blake Bros. on their property, the *Silver and Lead* group; also at the *Brenda* under the direction of Dan McIntosh, of Cranbrook.

### Placer-mining.

There was no pronounced activity in placer-mining during the season. On Wildhorse creek W. A. Drayton had a crew of men employed at hydraulicking and cleaning up the bed-rock; while it is understood that a little prospecting was done on the gravels of the Moyie river near Lumberton and up Perry creek.

### Gypsum.

Gypsum was mined by the Canada Cement Company at its deposits near Mayook Siding on the Crow's Nest Railway.

There are extensive marl-deposits within a short distance from Wardner, which could be mined and shipped at small cost, should a market ever develop for this material.

List of Producing Mines, showing Tonnage shipped.

| Mine. | Locality. | Tons. | Character of Shipment. |
|---|---|---|---|
| Aurora | Moyie | 612 | Silver-lead-zinc ore. |
| Guindon | Moyie | 21 | Silver-lead-zinc ore. |
| Stemwinder | Kimberley | 731 | Silver-lead-zinc ore. |
| St. Eugene | Moyie | 204,752 | Lead and zinc concentrates. |
| Sullivan | Kimberley | 1,248,530 | Silver-lead-zinc. |
| Red Eagle | | 1 | Silver-copper. |

## SLOCAN MINING DIVISION.

In reviewing the situation in the Slocan it is very gratifying to note that this famous Mining Division is now entering a period of greater production than has been experienced for many years. Although mining activities in this area have suffered vicissitudes from time to time owing to lack of satisfactory marketing conditions, production has always responded to improvements in metal prices.

The silver-lead-zinc ores which predominate could never be considered amenable to gravity concentration and separation by water, yet until fairly recent years this was the only known method. With the great strides that have been made in the separation of the metallic constituents of the ores by the oil-flotation process, losses have largely been eliminated and high-grade concentrates are now produced which are more acceptable to the smelter and hence derive the benefit of lower treatment charges. So that now jigs, tables, and the necessary cumbersome and expensive accessory equipment is discarded for straight flotation. By means of this process the zinc which formerly was a detriment to lead ores is converted into a valuable market product.

The situation in the Slocan and other parts of the district became greatly improved when in 1925 the Consolidated Mining and Smelting Company of Canada, Limited, announced that ores would be accepted for concentration. This meant that those properties which were not equipped with milling facilities could ship their ores to Trail and receive payment for the various metals contained. The result was that complex ores which were previously unmarketable began to pour in to the customs concentrator from properties far and wide throughout the district, with the results that in 1926 81,700 tons were treated at this plant. Being able to realize on milling-grade ore taken out during the course of development obviously enabled the property-owners to more readily finance their undertakings and in certain cases to block out sufficient tonnage to warrant the construction of their own concentrators. Among those which directly benefited by the acceptance of milling-ore at Trail, the *Lucky Jim*, *Whitewater*, and *Ruth-Hope* may be mentioned. Each of these properties is now equipped with its own concentrator.

The advantages of milling ore at the mine are as follows: A saving in freight rates, a lower cost of milling, and elimination of the selective mining which is necessary to keep the grade sufficiently high to stand freight and treatment charges. It is also logical to assume that by continually working on one character of ore better results might be expected than at a customs plant where the grade and character of the ore is continually changing. However, this remains to be proved, as the new mills have not had a chance yet to show what they are capable of doing.

The result of the work of the Geological Survey of Canada in the Slocan area under C. E. Cairnes will be looked forward to with great interest, as it will undoubtedly contain valuable information for the mine-owner, prospector, and field engineer. The more detail work done by J. J. O'Neill, of McGill University, in the *Ruth-Hope*, *Lucky Jim*, and other properties in which the Victoria Syndicate is interested has done a lot towards helping to unravel complicated geological problems and towards guiding future development.

Recent work at the *Whitewater* and *Lucky Jim* mines has attracted the attention of mining engineers to the potentialities of the limestone-bands of the Slocan series, in which important replacement deposits have been found to occur along zones of cross-fracturing, although there may be little evidence of mineralization in the adjoining argillites.

In reading the paper presented by Cairnes at the meeting of the Canadian Institute of Mining and Metallurgy at Spokane in 1926, the following items appealed to the writer as being of special interest to those engaged in mining in the Slocan: That the predominant strike of the

veins is north-east and south-west. This trend of the fissures corresponds to the master system of jointing and cuts the formations, thus affording permanent channels for ore-deposition. Hence it appears that in the majority of cases the fissures striking north-east and dipping to the south-east are more favourable for ore-deposition than those following other courses. That the structure and composition of the wall-rock have an important bearing on the size and continuity of the ore-shoots, and that, generally speaking, fissures are best developed in the more blocky ground, which is better able to preserve the lines of fracture than the more fissile slaty rocks.

Further to the above, it may be mentioned that the work done by O'Neill has emphasized the fact that folding of the beds has been an important factor in controlling ore-deposition and that much can be learnt regarding possible ore occurrences by a close study of the rock flexures.

As regards production, it is interesting to note that for 1926 the value of the silver produced exceeded that of the lead, and the zinc that of the lead, which will probably be the order for 1927. Previously the value of the lead has always exceeded that of the zinc by a wide margin, except during the war, when the price of this metal was exceptionally high.

The Victoria Syndicate, of London, England, under the direction of R. H. Stewart, has given a decided impetus to mining in this Division by acquiring numerous interests and pursuing an extensive development and exploration campaign with a view to establishing a substantial and permanent production. More extended reference to the activities of this syndicate may be seen farther on in the report.

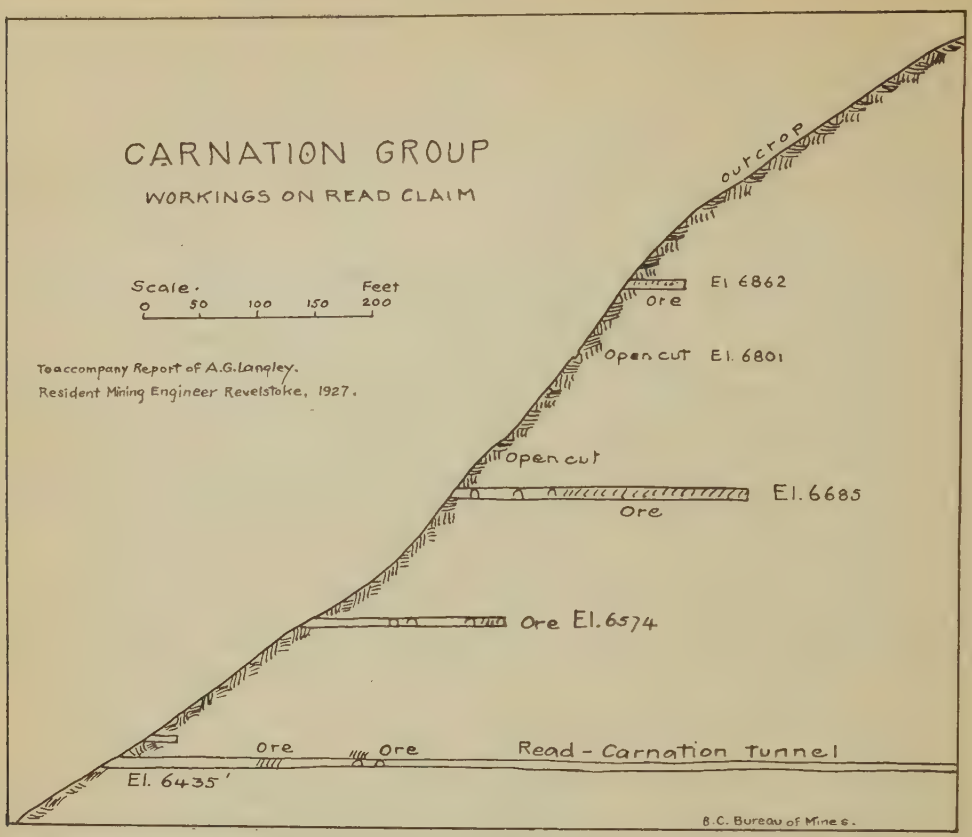
Good progress was made on road-construction during the year. The road connecting Slocan City with Silverton is now nearing completion, while that between Kaslo and Sandon will probably be completed during next year. These roads will be of great benefit to those operating in the Slocan as well as a convenience to many who wish to visit this important mining district.

### Sandon Camp.

**Carnation.** This property is owned and operated by the Victoria Syndicate. The underground work done during the year consisted chiefly of extending the drift on the vein from the north side to the south side of the ridge, making a total length of about 2,800 feet of tunnel. In this length a little ore was encountered, but not in sufficient quantity to be considered of any great commercial importance, and as yet no serious attempt has been made to further explore it. At the northerly portal of the tunnel modern camp buildings have been erected, including a cook-house and bunk-house with accommodation for about thirty men. These buildings, which are constructed of shiplap covered with a heavy roofing-paper and lined with 3-ply wood veneer, represent a good type of structure, being warm and comfortable as well as economical to build, especially when the cost of haulage is an important item of expense. In this case all the material for the camp and tramway was hauled over a 6-foot road from Sandon, a distance of 4 miles to an elevation of 3,000 feet above the town. Caterpillar tractors have now taken the place of horses and "go-devils."

At the southerly portal of the long tunnel and at an elevation of 6,455 feet the upper terminal of the aerial tram to the *Hewitt* mill has been erected in a deep excavation below the tunnel. This tram is of the Riblet type and has a length of 10,000 feet; over this it is intended to transport the ore developed on the *Read* immediately above. So far this ore-body has only been developed by short tunnels to an elevation of 6,685 feet, and a raise from the long tunnel was being driven during the latter part of the year to tap its downward continuation.

The vein on the south side of the summit has been prospected by short tunnels and open-cuts and can be traced to the summit through a vertical range of about 500 feet. At an elevation of 6,685 feet the vein has been drifted on for about 300 feet. It strikes easterly and westerly and dips 50° to the south, with slate on the hanging-wall and a band of calcite on the foot-wall. The vein-filling, in which the ore occurs in streaks and bunches, consists largely of crushed and sheared argillites, as evidenced by slickensided surfaces. The ore, which was difficult to distinguish on account of its finely crystalline structure and nature of the vein-filling, seemed to be confined to a width of from 3 to 5 feet next the hanging-wall. Car sampling done during the driving of this tunnel is said to have indicated good milling values, the principal being in silver. At an elevation of 6,862 feet a short tunnel driven on the vein develops a nice showing, which




would indicate the possible upward continuation of the ore-shoot exposed on the 6,685-foot level. Below this latter level the vein flattens in dip and is thought to be the continuation of that developed on the *Wakefield*.

**Victor.** This group is owned and operated by George Petty, of Sandon, and is situated on the westerly side of Carpenter creek at a short distance from Sandon. To review the salient features in connection with this property the following brief description is given: The vein, striking N. 50° E. and dipping at a steep angle, cuts a massive slate and quartzite formation in which occurs a well-mineralized zone traceable in a south-westerly direction to the *Queen Bess* on the other side of the mountain.

Development consists chiefly of three adit-levels which gain a depth of about 220 feet below the outcrop, and from which 300 tons of high-grade silver-lead ore, shipped during recent years, netted $44,761 at the smelter or $150 a ton.

On the No. 3 level ore varying in thickness from a few inches to about 1 foot is continuous for a length of 200 feet. During the present year systematic prospecting below this level by deep trenching through the heavy covering of overburden revealed the presence of high-grade float and the downward continuation of the vein was encountered at an additional depth of 170 feet; from this point a tunnel which had been advanced for a short distance exposed 18 inches of clean galena in the face.

Encouraged by the highly satisfactory results obtained on the above property, a considerable amount of prospecting-work has been undertaken by the owners of the *Cinderella* group, which adjoins it to the north, but so far, it is reported, the results have not quite come up to expectations.

**Silversmith.** This mine is owned and operated by the Silversmith Mines, Limited; capitalization, $500,000, divided into 2,500,000 shares at 20 cents par value; issued stock subject to a call of 5 cents a share. The president of the company is John B. White, of Spokane, and Oscar V. White is mine superintendent. The season's operations were successful in opening up a considerable tonnage of ore between the eighth and eleventh levels.

The ore-shoot developed last year to the east of the main ore-shoot on the eighth level was found to pinch out against a porphyry dyke on the hanging-wall side at a short distance above the level, but its downward continuation was picked up and developed on the ninth and tenth levels and partly prospected on the eleventh. In the stope from the tenth level a good grade of milling-ore is exposed along a length of 200 feet, with an average width of about 2 feet.

A new ore-shoot was also discovered in the hanging-wall side of the ore-zone between the eighth and ninth levels. In a stope below the eighth level this shows a length of 125 feet and average width of about 4 feet, with a strong showing in the face of the east end of the stope. The downward extent of this ore-body yet remains to be determined by further development, while the available backs above the stope were estimated at about 60 feet. On the tenth level a 2-foot width of good-grade zinc ore has been exposed for a length of 210 feet, with an average width of about 2 feet, while near the westerly boundary of the property a strong showing of high-grade lead ore is exposed in a small stope. The fact that these new ore-exposures are the result of a comparatively short period of exploration-work signifies that the possibilities are not yet exhausted in this section of the mine-workings.

The character of the ore occurrence and surrounding structural conditions do not allow an estimation of ore reserves being made with any great degree of accuracy, but the engineer in charge, who was thoroughly familiar with the mine-workings, considered that there was enough ore available at the present time to run the mill for about one year.

The downward continuation of the famous *Slocan Star* ore-shoot below the tenth level, which has been partly explored by a shaft and a certain amount of drifting, is considered to hold good possibilities for further development, and with this object in view it is planned to sink another shaft at a distance of about 450 feet from the present one and continue sinking to a depth of 500 feet if necessary.

Production was curtailed during the latter part of the year and the concentrator closed down. The bulk of the concentrates produced, consisting of about 1,000 tons of zinc and between 400 and 500 tons of silver-lead concentrates, were being stored at the mill.

It is understood to be the intention of the management to carry on development with a view to blocking out sufficient tonnage to warrant additions and improvements to the mill for operations on a larger scale and thus lessen the cost of production.

**Slocan King.** This property is owned and operated by the Slocan King Mines, Limited; capitalization, 2,500,000 shares, par value 20 cents, and assessable to 10 cents a share. J. B. White, of Spokane, is president of the company. During the year the company added to its holdings by acquiring the *Richmond-Eureka* mine from the Consolidated Mining and Smelting Company. The large group of claims owned by this company covers the possible easterly extension of the *Silversmith* ore-zone and the area covering the downward continuation of the *Richmond-Eureka* vein. The *Richmond-Eureka*, which has been lying comparatively idle during recent years, was formerly worked extensively by the Consolidated Mining and Smelting Company.

Exploration on the *Slocan King* was being confined to the advancement of two tunnels, the upper being the No. 5 (*Slocan King*) and the lower the No. 10 (*Silversmith*). Preliminary diamond-drilling from the No. 5 level disclosed the presence of high-grade silver-lead ore beyond the end of the old workings. This ore, subsequently encountered by tunnelling, was found to lie in a north-and-south shear-zone and was evidently drag-ore of limited extent. When examined, prospecting-work was being undertaken to pick up the vein, but had not proceeded far enough to arrive at any definite results. These workings were approaching an interesting section of ground in which it was expected to pick up the downward continuation of the *Richmond-Eureka* ore-shoot. This level, which extends into the hill in an easterly direction for about 2,000 feet, follows a strong vein heavily mineralized with spathic iron and carrying a little ore in places; the same vein is developed for about 150 feet by the No. 5 (*Slocan Star*) level at an additional depth of about 50 feet.

The No. 10 (*Silversmith*) level had been advanced into the *Slocan King* ground for over 600 feet; in this tunnel mineralization can be traced for about 400 feet, the average width of which did not appear to exceed 18 inches, although in one place it forms a lens from 3 to 5 feet wide and 30 feet long of milling-grade ore. It is proposed to advance this level to explore the projected downward continuation of the *Richmond-Eureka* ore-bodies.

While the ore-exposures so far developed offer attractive possibilities for further development, not sufficient work had been done on the ore to allow any definite opinion to be formed regarding probable or available tonnage.

**Leadsmith.** This property is owned and operated by the Leadsmith Mines, Limited; capitalization, $500,000, par value 20 cents, assessable to 10 cents a share. The property is described in the Annual Report for 1926. During the present year the development consisted of the advancement of the drift in a westerly direction for 1,400 feet from the low crosscut tunnel. Along this distance the vein occupies a strong well-defined sheared fracture in argillaceous quartzites; its filling consists of spathic iron, calcite, and crushed country-rock, in which small pockets of ore had been encountered. Where rolls in the wall occurred the full width of the vein was not disclosed by the drift and such places suggested possibilities for further prospecting. A crew of five men was employed.

**Lucky Jim.** This mine is owned and operated by the Lucky Jim Lead and Zinc Company, Limited. The capitalization is now $300,000, divided into 3,000,000 shares at a par value of 10 cents each. A. G. Larson is president and J. V. Pohlman, of Spokane, secretary. The mine is situated at Zincton, on the Kaslo–Nakusp Railway. During the year the Victoria Syndicate acquired a large interest in this property, when the necessary capital was supplied for the erection of a concentrator with a rated capacity of 200 tons a day.

Ore shipments were well maintained until the beginning of June, when work was diverted to the construction of the concentrator and new camp buildings, also towards providing facilities for handling the ore.

A great transformation scene has resulted, and the camp, which formerly consisted of a few scattered and more or less dilapidated buildings, has lost its forlorn appearance and now consists of a group of well-placed modern buildings suggesting an air of permanency, backed by the management's faith in the future of the property.

The most important ore reserves so far developed lie between the 400-foot level and the surface. From this level the ore will be fed by gravity to the 500-foot level and from there by aerial tram to the top of a 90-foot raise connecting with the track to the mill. The building of this track necessitated tunnelling under a snowslide gulch. For handling supplies between the camp and the 400-foot level it was proposed to build a short length of aerial tram, which may also be used for ore.

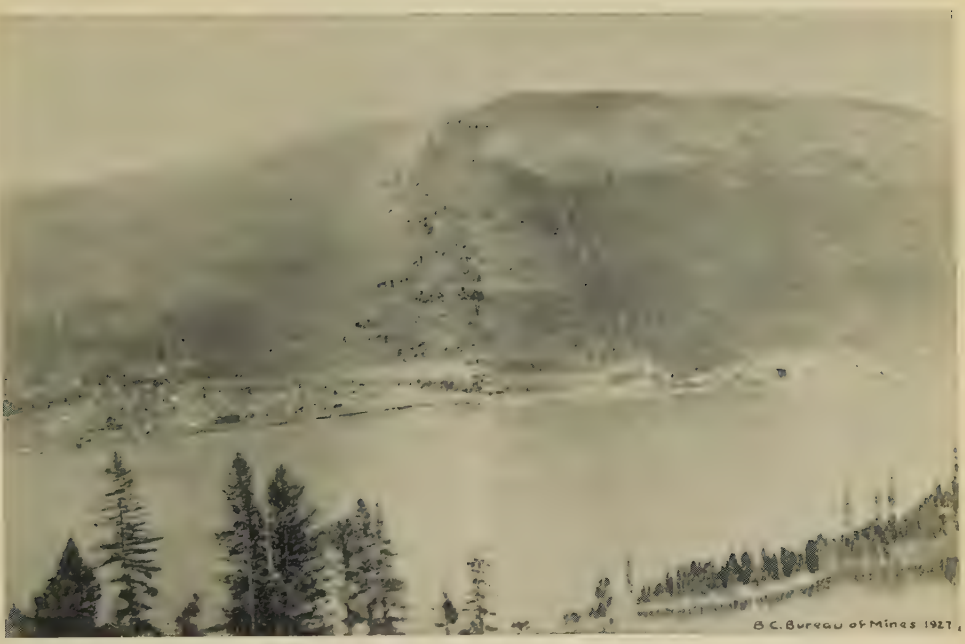
The mill, which was in the course of construction when visited, was designed by W. L. Ziegler and its flow-sheet embodies the latest flotation practice. From the receiving-bin the ore passes through a 15- by 24-inch Traylor crusher, then to a set of 42- by 14-inch Traylor rolls, and is delivered by a belt-conveyor to the mill-bin. This equipment is housed in a separate building. In the main building the ore first passes through an 8-foot by 36-inch Hardinge ball-mill in closed circuit with a Dorr classifier, the overflow from which supplies the feed for two 10-cell batteries of M.S. machines. The resulting concentrates after passing through an American filter are delivered to the cars by a belt-conveyor.

The power equipment consists of two 250-horse-power Vickers-Petters oil-engines and a 120-horse-power Fairbanks-Morse semi-Diesel engine. Everything is conveniently arranged and the design of the plant represents the last word in modern mill-construction. It is anticipated that operations will commence early in the year.

Accommodation at the camp has been greatly improved by the addition of two new bunk-houses, cook-houses, and office building with accommodation for the staff. During the construction period about seventy-two men were employed. Further reference to this property may be seen in the Annual Report for 1926.

**Ruth-Hope.** This property is being operated by the Ruth-Hope Mining Company under agreement to purchase. This company is now capitalized at $1,500,000, the par value of the shares being $1 each. R. H. Stewart, who has directed mining operations, is president and R. S. Lennie, of Vancouver, is secretary. Financing of the undertaking has received substantial assistance from the Victoria Syndicate. The extensive and well-planned development campaign extending over a number of years is, judging by present indications, about to be rewarded by a period of profitable production.

Work done during the year on the deep levels—namely, Nos. 5 and 6—has met with encouraging results; not only has considerably more ore been opened up, but by the aid of a geological examination by J. J. O'Neill more light has been thrown on the structural conditions




**Moyie Town and St. Eugene Mine.**

**Lucky Jim Mine, Slocan M.D.**

Whitewater Mines, Ltd.—Mill.

Ruth-Hope Mining Co., Ltd.—Mill.

controlling the ore occurrences, which no doubt will be of great value in planning future development. In this connection it may be mentioned that more importance is now attached to the folding of the strata than was done previously.

On the fifth level, which is 1,000 feet vertically below the outcrop, a considerable amount of drifting and a little stoping have been done on the westerly extension of the *Silversmith* ore-zone. Drifting on what is known as the North vein from the long crosscut has revealed the fact that the ore follows a somewhat irregular course, due to folding and faulting movements. For the first 170 feet the drift runs in a westerly direction and along this length an average width of 2.4 feet of milling-grade ore is exposed in the roof. Then swinging northerly the ore has been followed for 80 feet, showing an average width of 2.4 feet in the drift and 4.6 feet in the face of the stope some 15 or 20 feet above. The drift, again taking a turn to an easterly and westerly course, follows ore for an additional 100 feet, with an average width of 2 feet. At the westerly end of this ore-shoot a winze had been sunk on the ore for 140 feet to the sixth level. The ore, which is continuous in the winze, shows an average width of about 3 feet; towards the bottom it rolls and lying at a flat angle is exposed along the side of the drift on the sixth level for a length of about 80 feet, where it follows the foot-wall of a porphyry dyke. Not enough prospecting has yet been done to determine the extent of the ore on this level, which holds interesting possibilities.

Just what values the mill-feed will be found to contain when mining is started on a more extensive scale than has heretofore been undertaken is difficult to predict, but, judging by the grade of ore that has been shipped during the course of development, there will no doubt be a good margin of profit to the ton mined.

Apart from these deep level workings there are a number of exposures in the extensive upper workings which promise considerable tonnage for the mill. It was only this year that new ore was discovered in the No. 2 level in virgin ground 400 feet below the surface. So far this has only been prospected by a raise, but the indications are favourable for an ore-shoot about 100 feet long.

In view of the satisfactory results obtained by recent development, the company decided during the summer to reconstruct the old mill and add an up-to-date flotation plant with a rated capacity of 50 tons a day.

In order to provide power for the operation of the concentrator and compressor, it was necessary to build a new 20- by 18-inch flume between 7,000 and 8,000 feet long and install a 170-horse-power Vickers-Petters oil-engine for auxiliary power during low-water season. Three Pelton wheels have been installed—one for the flotation-machines, one for the crushing plant, and one for the air-compressor.

The equipment of the concentrator will consist of the usual coarse-crushing machinery, a ball-mill, Dorr classifier, sixteen 15-inch M.S. cells, American filter, and necessary accessories.

During the time that alterations were being made to the power plant work in the lower mine-workings was necessarily suspended, but resumed early in December. It is anticipated that the mill will be running by about the end of February, 1928.

**Rambler-Cariboo.** This property is owned by Rambler-Cariboo Mines, Limited; capitalization, $1,750,000, shares $1 par value. A. F. McClaine, Jr., of Spokane, is secretary.

A hurried visit was made to this property to determine whether conditions warranted improvements to the road connecting the old mill with the upper terminal of the tramway for the purpose of shipping a large tonnage of tailings, resulting from operations of the upper section of mine undertaken some twenty or twenty-five years ago. These tailings were impounded by a cribbing and approximately represented a tonnage of 6,000 tons. Haphazard sampling done at a few places indicated fairly good values, but, taking these as a basis to figure possible profits, it was found that the small margin remaining after deducting handling, freight to Trail, milling, and treatment costs made this undertaking too speculative to be attractive. However, it was decided that conditions fully warranted systematic sampling with a view of determining not only the values, but the grade that might possibly be profitably shipped by selective mining of the dump.

During the year the mine was worked under the terms of a lease by P. W. Lawrence, who employed a crew of about ten men. Work was confined to mining an ore-shoot between the tenth and eleventh levels, where the ore showed a length of about 70 feet. A fair tonnage had been extracted from just below the tenth level and when visited a raise was being driven from

the eleventh level to pick up its downward continuation. Time did not allow an examination of the extensive mine-workings on this occasion, so only a few brief notes are submitted.

After the abandonment of the old mill and upper workings many years ago a low crosscut tunnel approximately 1 mile in length was driven and intersected the vein at a depth of 1,400 feet. The vein, striking northerly and southerly and dipping to the south at a steep angle, is a persistent fissure, from which a large tonnage of ore has been mined. It lies partly in the sediments and partly in granite. The ore is silver-lead-zinc, usually carrying a high silver ratio of about 4 oz. in silver to the unit of lead.

From a study of the mine-map and from information submitted by those familiar with the property there appeared to be considerable areas of virgin ground, both in the upper and lower sections of the workings, which offered attractive possibilities for further development and suggested that the mine would be well worthy of a careful and thorough examination. The property is conveniently situated to the railway and equipped with an aerial tramway to the concentrator at the track, which could be remodelled at no very great expense for straight flotation; while the long crosscut tunnel provides excellent facilities for handling the ore and for the development of potential areas to great depth below the surface. For a description of the old mine-workings refer to Annual Report for 1911.

**Great Western.**

At this property, situated in McGuigan basin, Bruce Kirk, of New Denver, put in a season at leasing. Work was principally confined to the No. 3 level, from which a small tonnage had been mined and sorted for shipment. This ore occurred as a small lens in a crushed slate formation at the end of the level; a sample across its width of 12 inches gave the following returns: Gold, 0.02 oz. to the ton; silver, 8.7 oz. to the ton; lead, 10.9 per cent.; zinc, 24.3 per cent.; while a grab sample of the sorted ore ran: Gold, 0.01 oz. to the ton; silver, 18.5 oz. to the ton; lead, 28.4 per cent.; zinc, 19 per cent. The ground was greatly disturbed and the possibilities disclosed by the limited amount of work done on this level were indefinite, but apparently worthy of further prospecting.

A sample taken across a 5-foot section of the tailing-dump of the old *Washington* mill gave the following returns: Gold, 0.02 oz. to the ton; silver, 12.7 oz. to the ton; lead, 2.1 per cent.; zinc, 6.9 per cent. There was a probable 600 tons in this dump, which is situated within a short distance of the upper terminal of the *Rambler-Cariboo* tramway.

**Elkhorn.**

This property was being worked under the terms of a lease by George Allen, of Sandon. It is conveniently situated within a short distance of the *Silversmith* mill. The vein occupies a sheared fracture striking north-west and dipping to the south-west. Work was being confined to the No. 2 level, where streaks and bunches of ore can be traced over a length of about 200 feet, with favourable indications in the bottom of the drift for its downward continuation.

In a stope at a short distance above the level a small lens of ore was being mined for shipment. There is evidence of strong mineralization and conditions would appear to warrant further prospecting. The ore being mined was of milling grade; a car-load shipped to Trail carried the following values: Gold, 0.043 oz. to the ton; silver, 8 oz. to the ton; lead, 6.9 per cent.; zinc, 17.4 per cent.

**Black Grouse.**

This group, comprising the *Black Grouse*, *Silver Leaf*, *Pine Tree*, and *Furlong Fraction*, is owned by R. Fowlie, of New Denver, and is situated on Kane creek at a distance of 2 miles from Three Forks. Several tunnels have been driven into the steep hillside to prospect a strong quartz vein, which, striking N. 45° E. and dipping at 45° to the north-west, closely follows a quartz-porphyry dyke which lies on the foot-wall side. The upper tunnel crosscuts this vein at a distance of 75 feet from its portal. On the hanging-wall side there is evidence of a strong shearing movement in a slate formation. In this sheared ground small pockets of ore have been encountered and near the end of a short drift there was evidence of slight mineralization; a sample taken here gave the following returns: Gold, 0.02 oz. to the ton; silver, 6.6 oz. to the ton; lead, 2.7 per cent.; zinc, 2.7 per cent.

Below these workings another tunnel had been driven at an additional depth of 100 feet, which intersected the sheared zone at 200 feet from the portal. Similar conditions were found to prevail here and a little ore had been stoped, some years ago, from small lenses. The ground is greatly disturbed by faulting movements and a considerable amount of tunnelling had been done in an endeavour to pick up the continuation of the ore. The quartz vein itself did not carry values and was only useful as a guide as to where the ore might be expected.

Among the numerous activities not elsewhere mentioned, the following have been reported: During the early part of the year a considerable tonnage was shipped by Paul Lincoln from the *Noble Five*. Operations were temporarily suspended in the summer owing to a serious accident caused by the breaking of the hoist-cable, but resumed again towards the end of the year.

At the *Gem*, near Cody, M. Byrns, the owner, has accomplished a lot of underground work single-handed, during recent years, in an endeavour to find the vein whence large quantities of high-grade silver-lead float had come. A considerable tonnage of this ore has in past years been won from the bed of the creek by placer methods.

The *Colonial* on Cody creek was operated in a small way by American interests and a shipment made to Trail. The *Oro* was worked during the summer by A. Stonier, of Sandon.

At the *Canadian* Joe Brandon, the owner, and about ten leasers were busy during the season. During recent years leasing operations which have been principally confined to the uppermost or No. 1 level have resulted in the winning of a substantial tonnage of high-grade silver-lead ore, which has been sorted and sacked for shipment. This would indicate that there should be good possibilities for further exploration-work from the lower levels. The old workings, which consist of eight levels, gain a depth of about 1,700 feet on the dip of the vein. The tonnage extracted this year is given as about 100 tons, with an average value of about as follows: Silver, 140 oz. to the ton; lead, 68 per cent.; zinc, 2 per cent. This closely corresponds to the values of previous shipments.

At the *Corinth* a small crew was employed at development-work by the Corinth Silver-Lead Mines Company, Limited, of Seattle. George Gormley, who for a number of years has been operating the *Monitor* at Three Forks, under the terms of a lease and bond from the Rosebery-Surprise Mining Company, reports satisfactory results to have been obtained by opening up the low level of the old workings, and the possibilities appear to be good for winning an appreciable tonnage of milling-grade ore.

Mining and development-work was continued during the year at the *Wonderful* by Clarence Cuningham. W. J. McMillan spent the season on the *Alps Alturas* at the head of Kane creek.

A little work was done at the *Sovereign* by the American Boy Mining Company, which is reported to have acquired the property from Clarence Cunningham. Leasers were busy at the *Idaho-Alamo*, *Queen Bess*, *Trade Dollar*, and other properties.

### Silverton Camp.

**Hewitt.**

This property, which is situated at about 3½ miles from Silverton, was acquired by the Victoria Syndicate last year. It is one of the best-known properties in the Slocan and has been operated intermittently for a long period, with a substantial production to its credit. The ore is high-grade silver-zinc-lead, the principal values being in the silver and zinc; the gangue is principally quartz. Owing to the difficulties in saving the silver values, which occurred in the form of ruby silver and grey copper, by water gravitation and early flotation practice, the record of past operations is hardly a criterion for what may be expected in the future.

Recent work done under the direction of R. H. Stewart consisted of the advancement of the Nos. 8 and 9 levels. The object of driving the No. 8 level was to develop the downward continuation of the main ore-body, which in the bottom of No. 7 shows a length of about 200 feet. According to reports from the management, the drift has reached its objective and encountered the ore-body as expected. The vertical distance between the two levels is 337 feet. The No. 9 level, which has been driven at a vertical depth of 150 feet below the No. 8, has encountered the downward continuation of the easterly ore-body, known as the "Cunningham" ore-body. This ore-shoot shows a length of about 100 feet on the eighth level.

The mill, which has a capacity of 50 to 60 tons a day, has been greatly improved by the addition of sixteen 15-inch M.S. cells, Dorr classifier, American filter, and accessories. Test runs indicate that excellent recoveries will be made of the silver values. About fifty men are employed and it is anticipated that production will be steadily maintained.

The *Mammoth* was operated by the Porcupine Goldfields Development and Finance Company during the earlier part of the year and subsequently relinquished, when operations were continued by R. A. Grimes, who held the property under a prior agreement with the original owners. The development now being carried on is reported to be meeting with highly satisfactory results.

The *Galena Farm* was worked continuously by Joe Johnson and partners and a substantial tonnage of milling-ore was shipped to Trail. At the end of the year W. L. Sheeler and associates, of San Francisco, acquired a controlling interest and intend to immediately proceed with the installation of a small flotation plant. The ore-body discovered by the leasers last year has yielded satisfactorily to development and it is considered that the possibilities of the property are far from exhausted.

At the *Van Roi*, which adjoins the *Hewitt* and is owned by Clarence Cunningham, a number of leasers put in a busy season, with results that are reported to have been highly satisfactory.

At the *Standard* leasing operations were undertaken and a considerable tonnage shipped to Trail.

At the *Fisher Maiden* George Long and partners were successful in winning some high-grade ore, of which several car-loads were shipped to Trail. The present workings, consisting of two short tunnels driven at a slight elevation above the creek, have no connection with the old workings, but resulted from prospecting in the fall of last year. The formation is syenite. These workings have so far disclosed a short length of vein in place, having a north-easterly strike and dip of 65°, to be faulted by a strong easterly and westerly shear, in which "drag" ore is found to occur in small lenses. The vein shows a width of about 14 inches of ore. The ore is high-grade silver-lead-zinc, the silver values being in pyrargyrite and grey copper. A sample of sorted ore for shipment ran: Gold, 0.04 oz. to the ton; silver, 104.7 oz. to the ton; lead, 44.8 per cent.; zinc, 10.9 per cent.

W. Valentine put in a season at his claims at the head of Silverton creek and J. Harvey at his property on Granite creek. Ed. Shannon did further prospecting at the *Denver* group on Red mountain.

List of Producing Mines, showing Tonnage shipped.

| Mine. | Locality. | Tons. | Character of Shipment. |
|---|---|---|---|
| Antoine | Sandon | 6 | Silver-lead-zinc ore. |
| Bosun | New Denver | 1,245 | Silver-lead ore. |
| Canadian | Sandon | 121 | Silver-lead-zinc ore. |
| Colonial | Sandon | 64 | Silver-lead ore. |
| Dora | Sandon | 2 | Silver-lead ore. |
| Fisher Maiden | Silverton | 81 | Silver-lead ore. |
| Galena Farm | Silverton | 1,049 | Silver-lead-zinc ore. |
| * Hewitt | Silverton | 1,046 | Concentrates. |
| Hidden Treasure | Sandon | 9 | Silver-lead-zinc ore. |
| Idaho-Alamo | Alamo | 59 | Silver-lead-zinc ore. |
| Lucky Jim | Zincton | 9,727 | Silver-lead-zinc ore. |
| Mammoth | Silverton | 341 | Silver-lead-zinc ore. |
| Metallic | Sandon | 12 | Silver-zinc-lead ore. |
| Minnehaha | Sandon | 99 | Silver-lead-zinc ore. |
| Molly Hughes | New Denver | 33 | Silver ore. |
| Monitor | Three Forks | 291 | Silver-lead-zinc ore. |
| Mountain Chief | New Denver | 223 | Silver-lead-zinc ore. |
| Mountain Con | Sandon | 10 | Silver-lead-zinc ore. |
| Noble Five | Sandon | 1,246 | Silver-lead-zinc ore. |
| Oro | Sandon | 8 | Silver-lead-zinc ore. |
| Queen Bess | Three Forks | 32 | Silver-lead-zinc ore. |
| Rambler-Cariboo | Rambler | 586 | Silver-lead-zinc ore. |
| Ruth-Hope | Sandon | 1,313 | Silver-lead-zinc ore. |
| * Silversmith | Sandon | 4,877 | Silver-lead ore and concentrates. |
| Sovereign | Sandon | 114 | Silver-lead-zinc ore. |
| Standard | Silverton | 990 | Silver-lead-zinc ore. |
| Surprise | Sandon | 24 | Silver-lead-zinc ore. |
| Trade Dollar | Sandon | 33 | Silver-lead-zinc ore. |
| Van Roi | Silverton | 311 | Lead and zinc concentrates. |
| Victor | Sandon | 79 | Silver-lead-zinc ore. |
| Wonderful | Sandon | 690 | Silver-lead-zinc ore. |

* Large part of concentrates produced during year not shipped.

New Denver.

The *Bosun* was operated by the Rosebery-Surprise Mining Company during the year with a crew of about twenty-five men. From the main adit a 140-foot shaft has been sunk and another

level established. On this lowest level the vein is small but persistent, and ore, which was being stoped along a length of about 230 feet, showed greatest widths where rolls in hanging-wall occurred. Clean silver-lead ore was being sorted for shipment.

The *Mountain Chief* mine near New Denver has been actively operated by leasers. A considerable tonnage of old stope fillings have been treated by a small power-driven jigging plant erected at a short distance from the workings.

The *Molly Hughes* on Slocan lake was operated by a small crew. It is understood that additional capital for plant-improvement and facilities for handling the ore and supplies is being supplied by Spokane interests.

## SLOCAN CITY MINING DIVISION.

**Enterprise.** The *Enterprise* on Enterprise creek was again the most important producer in this Division. Although only a small crew of men was employed, a considerable tonnage of silver-lead-zinc ore was shipped to Trail. The haulage and handling costs could be eliminated to a large extent if the ore were concentrated at the mine. The property, which is described in previous Annual Reports, is equipped with an old mill and well provided with camp buildings. A flotation unit and accessory equipment could probably be installed at small cost, which could soon be amortized by increased profit to the ton of ore mined. The property is controlled by E. C. Wragge, of Nelson.

During the year ore was mined from between the fourth and fifth levels. In the lower sections of the mine there is a considerable area of virgin ground below the old stopes which should yield a substantial tonnage of good-grade ore.

A good deal of prospecting has been done on another vein, referred to as the No. 2 vein, and while the possibilities appear attractive, the work done so far is inconclusive. A shipment of about 130 tons made in the early part of the year gave the following assay returns: Gold, trace; silver, 41.2 oz. to the ton; lead, 18.7 per cent.; zinc, 26.1 per cent. For further reference *see* Annual Report for 1924.

**Hope No. 2.*** This property, situated on the First North fork of Lemon creek, has been acquired by the Piedmont Mines, Limited, of Regina, Sask., which has been actively engaged in installing machinery and other work preliminary to a vigorous plan of development. Extensive repairs were made to the road and substantial camp buildings erected. An aerial tram 5,500 feet long connecting the workings with the road was built and the machinery installed includes an Ingersoll-Rand 2-stage 750-cubic-foot compressor and a 132-horse-power Crossley fuel-oil engine. Including the temporary construction crew, some thirty men have been employed.

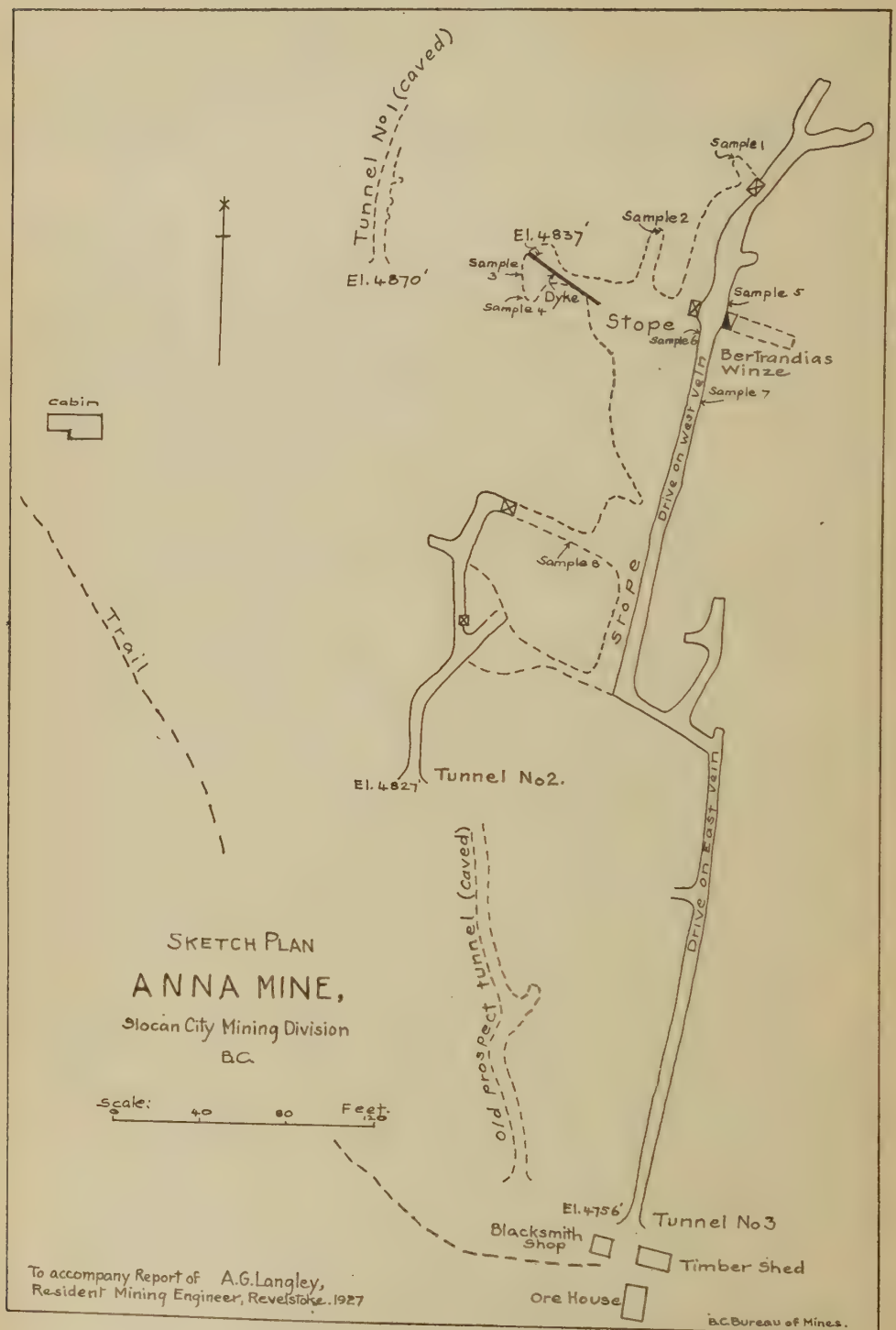
The superficial workings, which are situated at an elevation of about 5,300 feet, or about 1,720 feet vertically above the lower tram terminal, develop extensive iron-stained outcrops consisting in places of an intimate mixture of iron, lead, and zinc sulphides. The formation is composed of metamorphosed sedimentaries intruded by granite in the vicinity of the deposits.

The small amount of work done before the property was acquired by the present operators did not afford much information as to the character of the deposits, which, however, are extensive and have possibilities meriting investigation.

**First Thought Fraction.*** Below the *Hope*, on the Cameronian Creek slope, similar mineralization in wide zones is exposed on the property, which consists of the *First Thought Fraction*, *Success*, *Motherlode Fraction*, and *Diamond Jubilee Fraction* claims, owned by F. and J. Binnish, of Slocan City. A little superficial work has been done on wide iron-stained exposures, containing impregnations of galena and zinc-blende in places, lying parallel to and about 1,000 feet lower than the *Hope* deposits.

A sample taken across a mineralized band 14 feet wide, which is part of an iron-stained exposure about 40 feet wide, and 30 feet long, assayed: Gold, 0.03 oz. to the ton; silver, 3.9 oz. to the ton; lead, 2.3 per cent.; zinc, 3 per cent.

**Anna.*** The *Anna* Group consists of the following: *Anna*, *Milda H.*, *Milda H. Fraction*, and *Hamilton Fraction*. K. Zimmerman owns the controlling interest in the group, which is under lease and bond to N. Bertrandias, of Portland, Ore. The property is situated on the northern side of Springer creek and adjoins the *Ottawa* on the east. A good road extends from the shipping-point at Slocan City to within a quarter of a mile of the *Anna* workings, which are connected with the road by a wide trail on an easy grade.


Tunnel No 1 (caved)
El. 4870'
El. 4837'
Sample 1
Sample 2
Sample 3
Sample 4
Dyke
Stope
Sample 5
Sample 6
BerTrandias Winze
Sample 7
Drive on west vein
cabin
Trail
Sample 8
Stope
El. 4827'
Tunnel No 2.
Drive on east vein
old prospect tunnel (caved)
SKETCH PLAN
ANNA MINE,
Slocan City Mining Division
B.C.
Scale: 40 0 40 Feet.
El. 4756'
Tunnel No 3
Blacksmith Shop
Timber Shed
Ore House
To accompany Report of A.G. Langley, Resident Mining Engineer, Revelstoke. 1927
B.C. Bureau of Mines.

The elevation of the main working-tunnel is about 4,756 feet, or a little more than 1,000 feet above the level of Springer creek. The property has no significant history, but has been worked intermittently by the owner, almost single-handed, for over twenty years. The formation of the surrounding area consists of granitic rocks of the Nelson batholith.

On the *Anna* there are two veins, or sheared fissured zones, cutting the granite, known as the east and west veins. These fissures, which have a strike of about N. 10° E. and dip about 35° to the east, evidently belong to the same parallel series in which the neighbouring *Ottawa* and *Arlington* deposits are situated.

On the *Anna* most of the work has been done on the west vein, in which high-grade ore occurs in siliceous stringers and lenses. The width of the west vein is from 12 to 15 feet and narrow lenses of pay-ore are found anywhere between these limits. The east vein, on which a small amount of work has been done, has an apparent width of about 50 feet.

The character of the ore-bodies in the west vein would indicate that they owe their origin to replacement by the circulation of mineral-bearing solutions or vapours through small channels and filling interstices in the sheared material between the walls of the fissure and that continuity may be expected with depth.

The ore, which contains high silver values, consists of tetrahedrite, native silver, occasional argentite and stephanite, together with pyrite and minute amounts of lead, zinc, and copper sulphides. The gangue is chiefly quartz and altered country-rock with occasional barytes.

Three short prospect-tunnels above the main working, or No. 3 tunnel, are temporarily inaccessible for examination on account of caving. No. 3 tunnel is driven along the east vein for a length of about 240 feet, throughout which distance no ore of importance was encountered. At the end of this distance a 50-foot crosscut westerly strikes the west vein, from which most of the ore has been mined and shipped.

From the crosscut the west vein has been drifted on northerly for a length of about 300 feet and some stoping of a selective nature was done throughout the greater part of this distance, as shown on the accompanying plan. At the southerly end of the drift on the west vein two raises, spaced 60 feet apart, from which a little stoping was done, connects with the No. 2 tunnel. Below the level, as shown on the plan, an inclined winze was sunk about 50 feet during the time that N. Bertrandias was operating the property in 1926.

Patches of ore remain in the stopes above the No. 3 tunnel and in the floor of the level, as shown by the following samples, the positions of which are shown on the plan:—

Sample No. 1. Width, 48 inches: Gold, trace; silver, 16.1 oz. to the ton.
Sample No. 2. Width, 6 inches: Gold, 0.07 oz. to the ton; silver, 608.6 oz. to the ton.
Sample No. 3. Width, 24 inches: Gold, 0.02 oz. to the ton; silver, 144.7 oz. to the ton.
Sample No. 4. Width, 36 inches: Gold, 0.32 oz. to the ton; silver, 46.9 oz. to the ton.
Sample No. 5. Width, 36 inches: Gold, trace; silver, 103.1 oz. to the ton.
Sample No. 6. Width, 4 inches: Gold, 0.01 oz. to the ton; silver, 295.2 oz. to the ton.
Sample No. 7. Width, 12 inches: Gold, 0.04 oz. to the ton; silver, 48.6 oz. to the ton.
Sample No. 8. Width, 54 inches: Gold, trace; silver, 5.2 oz. to the ton.

Owing to the flat dip of the vein there are considerable "backs" above the ore sampled in the stopes, roughly estimated to be at least 160 feet above No. 1 sample. There are, therefore, good ore possibilities in the blocks of ground above the stoped area along the centre of the drift. The basic dyke, from 4 to 5 feet wide, shown on the plan, does not apparently cause any displacement of the vein, as the ore has been found above and south-west of it, as at Nos. 3 and 4 samples and in the two raises.

The west vein is not developed southerly from the crosscut where it was first struck, and No. 8 sample, taken on the south side of the most southerly raise, indicates that ore may be found in that direction.

The 50-foot winze, now full of water, was sunk to explore a good showing in the level (between Nos. 5 and 6 samples). According to reliable report, the winze for the first 35 feet was sunk on the hanging-wall side of the showing; it then got steeper and broke into the ore, including an 8-inch pay-streak containing tetrahedrite and native silver. About 5 tons of high-grade ore was extracted and shipped from the winze during the early part of 1927.

Former shipments, according to smelter returns seen by the writer, were as follows:—

| Date. | Dry Weight. | Silver. | Lead. | Zinc. | Copper. |
|---|---|---|---|---|---|
| | Lb. | Oz. to Ton. | Per Cent. | Per Cent. | Per Cent. |
| July 17, 1912 | 7,460 | 126.40 | 1.0 | 1.2 | ..... |
| 1918 | 34,000* | 244.30 | .... | 0.6 | 0.70 |
| January 23, 1920 | 5,183 | 136.00 | .... | 0.5 | 0.33 |
| July 19, 1921 | 38,444 | 193.75 | .... | 0.5 | .... |
| April 6, 1922 | 13,409 | 135.30 | .... | 0.5 | .... |
| July 13, 1922 | 16,554 | 120.90 | Trace | 0.4 | .... |
| July 31, 1923 | 12,916 | 253.90 | Trace | 0.8 | .... |
| June 25, 1924 | 11,824 | 135.70 | .... | .... | .... |
| August 17, 1925 | 4,262 | 204.60 | Trace | 1.1 | .... |

* Approximate.

Smelter returns for two other lots were not available, but it is understood that they assayed around 200 oz. in silver to the ton.

The results of the work done at the adjoining *Ottawa*, where the formation is the same and where the character and occurrence of the ore in the upper workings were very similar, offer a clue to the possible development of the *Anna* property.

The *Ottawa* was extensively developed and has produced a considerable tonnage of high-grade silver ore. In the year 1904 the shipments amounted to about 1,330 tons of ore, which netted from the smelter $120,000, the actual profit of the year's operations being about $70,000.

The following extracts from the published Report of the Provincial Mineralogist for 1904 show the similarity of conditions on the *Ottawa* and *Anna* properties: "On the *Ottawa* there are two distinct veins, developed by adit-tunnels, known respectively as the Ottawa or East vein and the Noble or West vein. Both veins are strong and clearly defined and both have a general north-and-south course and a dip to the east."

The strike approximately parallels the *Anna* veins and the dip, 37° to the east, is about the same. In this report it will be noted that the length of the ore-shoot in the upper workings was very short, but gradually lengthened out as depth was attained and on No. 4 level was nearly 300 feet long. The greatest stoped width recorded was 8 feet.

The *Anna* No. 3, or main working, corresponds to about the No. 3 level of the *Ottawa*, and most of the ore in the latter was extracted from below the No. 3 level, the best values having been found below the No. 4 level.

The *Anna* shear-zones are wide and well defined and there are good possibilities that in depth the lens-shaped ore-bodies, which are small in the upper workings, may assume larger dimensions as at the *Ottawa*.

Briefly summarizing the situation with regard to the *Anna*, there are, in the writer's opinion, interesting possibilities with deep development corresponding with the lower levels of the *Ottawa*, while small bodies of ore, similar to those which have been mined, may be expected above the stoped portions on No. 3 level. Further possibilities for developing ore on this level include driving along the west vein towards the south and lateral development of the east and west veins to the north. The east vein should be developed opposite the ore-zone in the west vein.

Hitherto only the high-grade pay-streaks have been mined and it is possible that a thorough sampling of the workings would indicate an appreciable tonnage of lower-grade material which, when sufficient tonnage is developed, may be turned to account.

In the past there were difficulties presented by the concentration of the silver minerals. The successful application of the flotation process by L. H. Biggar at the *Ottawa* a few years ago suggests greater possibilities for many of the "dry-ore" properties. (Biggar's mill was unfortunately destroyed by fire after being in operation a short time.)

The *Anna* is favourably situated as to transportation, timber is convenient and plentiful, and water-power for mining and milling could be developed economically in the vicinity.

J. J. Cullinane and associates, who formerly operated the *I.X.L.* mine at Rossland with great success, acquired the *Metcor* mine on Springer creek and it is reported that a shipment of high-grade silver ore will be made. The *Anna*, which is now held under the terms of an

option by Portland interests, was inactive during the year, but it is reported that work will be resumed next spring. The original owner is Kurt Zimmerman, of Slocan City.

A little work was also reported to have been done at the *Westmount* on Enterprise creek by some Rossland miners, but results are not known at the time of writing.

List of Producing Mines, showing Tonnage shipped.

| Mine. | Locality. | Tons. | Character of Shipment. |
|---|---|---|---|
| Anna | Slocan City | 4 | Silver ore. |
| Enterprise | Enterprise Creek | 817 | Silver-lead-zinc ore. |

## AINSWORTH MINING DIVISION.

This important Division embraces a vast area confined between the divides of the mountain ranges to the east and west of Kootenay lake and the Duncan river. Geologically this great valley is referred to as the Purcell trench.

Among the first mines to be discovered in the district were those situated near the shores of Kootenay lake at Ainsworth and the famous *Bluebell* at Riondel.

### Riondel.

In the Kootenay Lake area of this Division the *Bluebell*, under the management of S. S. Fowler and B. L. Eastman, again was by far the largest producer. Unfortunately the low metal prices forced the temporary suspension of operations during the latter part of the year. However, it is confidently expected that work will be resumed early in the year, as plans are now under way for improvements to the mill and plant which will allow the treatment of a larger tonnage at reduced costs.

### Ainsworth Camp.

This camp, which dates back to the earliest days of mining in the West Kootenay, has been responsible for a substantial production of silver-lead-zinc ore. Of the zinc, however, only a comparatively small percentage of that mined has actually found its way to the smelter on account of inadequate marketing and milling facilities. With improved facilities now offered, zinc adds an appreciable value to the ores of this camp.

The area surrounding the camp is well mineralized and is easily accessible. The marked uniformity of the strata would suggest, generally speaking, continuity and persistence of ore-bodies. Although activities have extended over a long period, this section has probably not received as much attention from the prospector and small operator as the adjoining territory of the Slocan, where the ores carry higher silver values. During recent years the camp has been more or less overlooked, but with important developments now taking place it may be expected that increased activity will be witnessed during the coming year. A description of the geology and of many of the mining properties may be seen in Memoir 117 of the Geological Survey of Canada.

**Florence.** Exploration and development work at the *Florence* is being watched with widespread interest. This property is owned and operated by the Kootenay-Florence Mining Company, Limited, with a capitalization of $600,000, divided into 3,000,000 shares at 20 cents par value. The primary purpose of forming this company was to finance the driving of a 3,250-foot crosscut tunnel from a point at a short distance above the level of Kootenay lake to explore the downward continuation of important ore-bodies mined and developed in the old upper workings. This crosscut gains a vertical depth of about 370 feet, and according to recent reports is in over 2,000 feet, with favourable indications beginning to make their appearance.

In the ore-zone of the *Florence* two types of deposits were previously developed and a large tonnage of milling-grade ore was extracted, which gave the following values: Lead, 7.4 per cent.; zinc, 7 per cent.; silver, 2.5 oz. to the ton. (Refer Memoir 117, Geological Survey of Canada.)

The type of ore-bodies occurring as replacement deposits in limestone striking north and south has so far proved to be the more economically important. The other ore-bodies are of the

true fissure type, which, striking easterly and westerly, cut the formation and probably represent the main ore-channels.

Arrangements have been made with the City of Nelson for a supply of electric power, and this, with the favourable situation of the mine on the shore of Kootenay lake, should ensure low production costs.

The *Highland* was worked in a small way by the Consolidated Mining and Smelting Company and lessees shipped a few hundred tons of ore.

The *Banker* was operated by lessees, who made some small shipments until October, when the property was taken over by the Consolidated Mining and Smelting Company and grouped with the *Albion*. In December this company started driving a new tunnel to gain 215 feet depth below the surface.

The *Tiger* was worked in a small way under lease by T. B. Hansen, who shipped a car-load of silver-lead-zinc milling-ore. At the *Spokane-Trinket* G. MacPherson and C. Bridge worked steadily throughout the year. The *Lakeshore* made a small shipment of milling-ore, but no other work is reported to have been done this year.

**Silver Hoard.** Frank Kennedy and associates have leased this property with a view to interesting capital to continue development. The ore contains high values associated with lead and zinc sulphides. Reports on the *Silver Hoard* are contained in the Annual Report of the Minister of Mines for 1923 and in Geological Survey of Canada, Memoir 117. The property has possibilities meriting careful investigation.

At the *Violet* on Woodbury creek the results obtained by the further development of the vein are reported to have proved highly satisfactory. The ore is a "dry ore" carrying high silver values. New cabins have been erected and everything is in readiness for next season's work. The property is owned by J. Henry, W. G. McLanders, and Dan McLellan.

### Howser Lake, Duncan River, and Poplar Creek Section.

**Surprise.** This property, which is situated on Glacier creek near Howser and has been described in previous reports, is owned by F. A. Devereux, of Victoria, and was recently acquired under the terms of an option by Chicago interests. When visited during the present year the property was further examined and a few additional samples taken. Of these, one taken across the top of the stope from the No. 1 level gave the following returns for a width of 3 feet: Gold, 0.04 oz. to the ton; silver, 47.3 oz. to the ton; copper, 1.47 per cent. Between this point and the surface it was roughly estimated there were about 30 or 40 feet of backs.

Below the level the two winzes which had been sunk when the property was last operated disclosed disturbed conditions and indicated that faulting movements had displaced the vein about 20 feet to the hanging-wall side, where it apparently assumed its normal dip. A sample taken here across a width of 4 feet gave the following returns: Gold, 0.02 oz. to the ton; silver, 11.8 oz. to the ton; copper, 0.25 per cent. At the end of the No. 1 level a short crosscut had been driven into the foot-wall side of the vein. A sample of the muck remaining in the tunnel and which was considered to be representative of the average vein-filling at this point gave the following returns: Gold, 0.01 oz. to the ton; silver, 5.6 oz. to the ton; copper, 0.31 per cent. The dump from the No. 1 level, which had been impounded by a cribbing, probably contained between 800 and 1,000 tons of ore that would pay to put through a mill at the mine.

On the lowest level, which has been driven at an elevation of 110 feet below the No. 1, the additional work done in the last two years has been the advancement of the main tunnel for 25 feet and about 100 feet of crosscutting. At the time of examination a raise was being driven to connect with a winze from the tunnel above.

The first crosscut from the main tunnel in the foot-wall exposes a width of 18 feet of quartz. The second crosscut, driven at a point 96 feet farther into the hill, also discloses a strong width of quartz, which carries values; a sample taken across a width of 12.8 feet gave the following assay returns: Gold, 0.02 oz. to the ton; silver, 13.8 oz. to the ton; copper, 0.34 per cent. Another sample taken at this point across a narrow width of crushed and oxidized material, which it was thought might carry higher values, ran as follows: Gold, 0.01 oz. to the ton; silver, 3.7 oz. to the ton; copper, 0.3 per cent. The results obtained in this second crosscut appeared to warrant further development of the vein in this section of the workings.

Three men were employed underground. Conditions are favourable for low mining costs and power development should ore be found in quantity.

On Glacier creek the *Glacier Creek* group, described in the 1926 Annual Report, was bonded by W. L. Smith to the Consolidated Mining and Smelting Company, which did some preliminary surface work with a view to diamond-drilling during the coming season. It is reported that some 2,500 feet of water-pipe was laid on the property and that a diamond-drill outfit was taken in to Howser. The ore is lead-zinc occurring as replacement in limestone strata.

**Eileen.** This group consists of four claims belonging to J. Hincks, of Howser, and two claims to W. C. P. Heathcote, of Nelson. The area covered includes the side-hill immediately to the east of Howser lake. Prospecting by open-cuts has been principally confined to tracing the evidence of mineralization occurring along a formation slip between the bedding-planes of limestone. This occurrence is persistent in narrow width for a considerable distance and in several places small seams and pockets of galena have been disclosed in oxidized ledge-matter. So far the results of the limited amount of work accomplished are inconclusive as to possibilities, but suggest that further prospecting might be undertaken where there are indications of folding or cross-fracturing. The workings are conveniently situated at an elevation of about 800 feet above the lake.

At the *Red Elephant* on Hall creek the season's work is reported to have been highly satisfactory. The property was acquired last year by J. Moris, of Spokane, under option from the owners, Hugh McKay and J. W. Power, of Kaslo. The work done during the last two seasons included a 70-foot shaft and a tunnel 200 feet long driven to tap the vein in the shaft.

The Gertrude Creek trail was cleaned out and it is understood that Dan McPhail, of Kaslo, put in a season's work on the *Fresno*, where he claims to have some interesting showings carrying gold values. Early in the year 75 tons of silver-lead ore was shipped by Ed. Nordberg and associates from the *Lavina*, but no work has been reported during the summer.

**Riverside.*** This group, consisting of the following five claims: *Riverside*, *Giant*, *Joint*, *Howser*, and *Portland*, owned by J. Noihl, J. W. Mulholland, and W. Sturgeon, is situated on the northern side of McGuire creek, which flows into the Duncan river about 9 miles north of Howser lake, making a total distance of about 18 miles from Howser, which can be travelled by launch. The property, on which a small amount of work has been done by J. Noihl at intervals during the last few years, was formerly known as the *International*. A brief description of the property was published in the Annual Report of the Minister of Mines for 1918, page 162. On the opposite page there is a sketch-map showing the principal properties tributary to the upper Duncan river.

The workings are located on the steep mountain-side at an approximate elevation of 5,200 feet above sea-level or 3,100 feet above the Duncan river. The distance from the mine to the lower camp is about 3 miles by trail or 7,400 feet by air-line. There is a cabin near the workings and two cabins near the mouth of McGuire creek. The mountain-side rises abruptly from the river and becomes precipitous in the vicinity of the workings.

The geological formation of the area in which the property is situated consists of well-stratified rocks embracing quartzites, limestones, argillites, and grey schists. The whole group is provisionally classified as the Duncan series, which, according to M. F. Bancroft, is tentatively referred to the Pre-Carboniferous and is lithologically similar to the Summit series of the 49th parallel. (Summary Report, Geological Survey of Canada, 1917, Part B.) The country-rocks are schists.

The vein, from 2 to 4 feet wide where exposed, is of the bedded-fissure type, apparently coinciding in strike and dip with the enclosing schists. The associated minerals are galena and iron pyrites with occasional zinc-blende in a gangue of crushed and shattered quartz. The mineralization varies from disseminated galena of milling grade to stringers and masses of clean galena.

Some superficial workings consisting of two shallow incline shafts, open-cuts, and stripping develop from 700 to 800 feet of outcrop, which follows the contour of the hill. The development-work done is somewhat scattered and is insufficient to demonstrate the dimensions of the ore-shoots. At the south-easterly end of the outcrop workings open-cuts indicate a possible ore-shoot of an average width of 3 feet for a length of from 150 to 200 feet. A sample of clean galena assayed: Gold, trace; silver, 34.6 oz. to the ton; lead, 73.8 per cent.; zinc, 1 per cent. Time

was not available to systematically sample the vein for its milling values. The vein is clean cut and well defined and is reported on good authority to have been traced for several claims.

**Bullock Gold Mines, Ltd.***

The *Bullock* property is situated on the south-western side of the railway, about half-way between Poplar and Gold Hill Stations on the Lardeau branch of the Canadian Pacific Railway. As the situation in regard to the number of claims supposed to be owned by this company requires to be cleared up, some space is devoted to the question of title. According to the company's prospectus filed with the Registrar of Companies, Victoria, on July 7th, 1919, the Bullock Gold Mines, Limited, intended to acquire the following mineral claims: *Baby Bullock*, *Baby Bullock Nos. 3* and *4*, and *Bullock Fraction*.

These claims are understood to have been relocations of ground which had lapsed by R. H. Graves, W. J. Graves, and B. Maxfield. The first two are respectively secretary-treasurer and president of the Bullock Gold Mines, Limited. According to the official records at Kaslo at the end of the year, the above-mentioned claims still stood in the names of the locators, no transfers having been recorded.

Writing under date of November 28th, 1927, R. H. Graves, secretary, advises that the company has "control" of the following claims: *Baby Bullock*, *Baby Bullock No. 3* and *No. 4*, *Bullock Fraction*, *Bullock Fraction No. 2*, *Baby Bullock No. 7* and *No. 8*, *Galilleo*, and *Pluto*, the last two being Crown-granted.

*Bullock Nos. 5* and *6* claims, which had been located by the Bullock Gold Mines, Limited, were allowed to lapse in March, 1927. As regards the *Pluto*, Lot 8658, and *Galilleo*, Lot 8659, the grantees are respectively Bullock Gold Mines, Limited, and R. H. Graves. The Crown grants for the two claims have been held at the Nelson Land Registry Office, awaiting registration fees and certificate of tax payment since August, 1926, when the grants were made.

The principal work has been done on the *Baby Bullock* (officially recorded in the name of R. H. Graves), and on this claim the two large and substantial cabins of the Bullock Gold Mines, Limited, are situated.

A description of the property by A. G. Langley is contained in the Annual Report for 1920, since when the situation has not changed materially, although an appreciable amount of work has been done at intervals.

The camp buildings are situated at an elevation of about 3,400 feet above sea-level or about 1,200 feet above the railway at Bullock Siding, with which the property is connected by a trail 1½ miles in length.

The formation consists of schists striking north-westerly, with fairly flat dips to the north-east (dipping with the hill). Intercalated between the schists in places there is a green-brown weathering schistose rock, which is probably an altered eruptive. Cutting the schists, with approximately the same strike but with varying dips, there are a series of parallel, elongated lenses of quartz. On the surface the quartz in places is stained with iron oxide and in spots is mineralized with stringers and irregular disseminations of pyrite and arsenopyrite. At one point noted the iron sulphides are accompanied by small amounts of galena and zinc-blende. Occasionally free gold is found in small pockets of decomposed iron-stained material and along the contact of the quartz with the schist.

The mineralization exposed in the surface workings, which include a considerable amount of open-cutting and trenching over a length of about 1,000 feet of outcrop, is erratic and does not show any continuity. The following samples were taken from the surface workings:—

| Description. | Gold. | Silver. | Lead. | Zinc. |
|---|---|---|---|---|
| | Oz. to Ton. | Oz. to Ton. | Per Cent. | Per Cent. |
| Open-cut above No. 4 tunnel, across 4½ feet consisting of alternating bands of iron-stained quartz and green schistose rock containing some iron sulphides | 0.03 | 0.2 | .... | .... |
| Open-cut just above and south-east of portal of No. 1 tunnel, selected material from small pile | 0.12 | 2.5 | 2.1 | 0.7 |
| Open-cut just above and a little north-west of shaft connecting with No. 1 tunnel, across 20 inches of quartz heavily mineralized with pyrite and arsenopyrite | 0.41 | 0.3 | .... | .... |

SAMPLES—*Continued.*

| Description. | Gold. | Silver. | Lead. | Zinc. |
|---|---|---|---|---|
| | Oz. to Ton. | Oz. to Ton. | Per Cent. | Per Cent. |
| Open-cut a little north-west of last sample, across 30 inches of same band of quartz containing considerable pyrite and arsenopyrite | Trace | 0.1 | .... | .... |
| Open-cut full of water about 200 yards south-easterly from No. 1 tunnel, grab from small pile of oxidized quartz containing pyrite and arsenopyrite (selected material) | 0.08 | 1.2 | .... | .... |
| Open-cut just above 30-foot tunnel at south-eastern end of open-cuts, across 15 feet of oxidized quartz vein containing occasional pyrite and arsenopyrite | 0.01 | 0.2 | .... | .... |
| 30-foot tunnel about 300 yards south-easterly from No. 1 tunnel, across 15 feet of soft decomposed schist, rich in iron oxides | 0.03 | 0.2 | .... | .... |

The underground development, including several hundred feet of old workings which were made before the present company acquired the property, amounts to slightly more than 1,400 lineal feet in the aggregate.

There are six tunnels, which chiefly crosscut the strike of the veins and the formation, with a small amount of drifting, raising, and sinking. Some of these workings develop quartz veins which in every case samples show to be practically barren. The following samples were taken in the underground workings:—

| Description. | Gold. | Silver. |
|---|---|---|
| | Oz. to Ton. | Oz. to Ton. |
| No. 1 tunnel, 18-inch quartz vein at intersection of easterly drift, 80 feet from portal of main crosscut | 0.02 | 0.1 |
| No. 1 tunnel, 15-inch quartz vein in westerly drift (80 feet along crosscut from portal) below raise connecting with shaft from surface | Trace | 0.1 |
| No. 1 tunnel, average sample of 18-inch quartz vein in easterly drift 80 feet along crosscut from portal | Trace | 0.1 |
| No. 1 tunnel, average sample of quartz vein 4 to 6 feet wide in easterly drift 80 feet along crosscut from portal | Trace | 0.1 |
| No. 2 tunnel, across a foot of quartz in face | 0.03 | 0.1 |
| No. 4 tunnel, across 5 feet of iron-stained quartz at end of main tunnel | 0.02 | 0.6 |
| No. 6 tunnel, 6-inch quartz vein above winze in easterly drift | 0.01 | 1.1 |
| No. 6 tunnel, across 30 inches of quartz near top of winze (separated from 6-inch band of last sample by 18 inches of waste) | 0.02 | 0.9 |
| No. 6 tunnel, across 30 inches of quartz vein in face of easterly drift | 0.02 | 0.1 |

Nos. 3 and 5 tunnels contain quartz-showings, apparently barren, which were not sampled. In addition to the above samples, three specimens of pyritized rock selected by the management and stated to contain "colloid" gold and platinum were assayed and found to contain negligible amounts of gold and no platinum.

Summarizing results of work done by the Bullock Gold Mines, Limited, it may be said that at points on the surface high gold assays may be obtained, but no ore in any quantity has as yet been shown up on the property, underground or on the surface.

In the Poplar Creek area Joe Gallo had a small crew of men employed at the *White Eagle* on Cascade creek during the fall and expects to make a shipment this winter. At the *Noonday* on the same creek P. J. Sheran had a few men working during the summer. At the *Maggie* at the head of Meadow creek H. Newcomen is reported to have put in a season's work. Eric Strand, of Poplar, is also reported to have done further work on his claims on Tenderfoot creek.

## KASLO.

### *Keen Creek Area.*

Keen creek as usual was the scene of many prospecting and development activities. The majority of properties in this area are in the Slocan series, the ores being similar in character and occurrence to those of the Slocan.

Cork-Province.

This mine is owned and operated by the Cork-Province Mines, Limited; capitalization, $1,000,000, divided into 3,000,000 common shares of 25 cents each and 250,000 preference shares of $1. W. H. Burgess, of Kaslo, is managing director. The property was not examined during the year, but the following information, which is considered to be reliable, has been supplied by the management: During the year the main shaft was sunk 150 feet below the No. 4 level or about 250 feet below the No. 3, which is the main adit. The vein was followed down and showed good widths of milling-grade ore carrying values in silver, lead, and zinc. At the No. 5 level the vein shows a width of 16 feet, consisting of siderite, calcite, and altered limestone gangue, with disseminations and lenses of lead and zinc ore. During the latter part of the year the pumping plant at the shaft was insufficient to handle the flow of water, so, pending the installation of another pump, development was confined to the No. 3 level. Here it is stated that an important discovery was made in shear-zones following the strike and dip of the limestone. It is stated the ore-body so far explored has been drifted on for 270 feet, with ore in the walls and face of the drift, so its extent has not yet been defined. The lead content is said to be about 10 to 15 per cent. and all the muck from this drift has been stored for milling. The No. 4 level has penetrated the west end of this ore-body and drifting will be proceeded with. It is understood that the mill will be remodelled as soon as sufficient ore has been blocked out.

The Daybreak Mining Company, in which Portland capital is principally interested, has been busily engaged at further development of the property formerly known as the *Gibson*. An aerial tramway 5,081 feet in length has been constructed to the wagon-road and shipments have been steadily maintained during the year. From the foot of the tram the ore is hauled for a distance of about 6½ miles to the railway siding at Zwicky. During the latter part of the season truck-haulage was abandoned in favour of a Fordson tractor and wagons. The ore is silver-lead-zinc.

Results of the season's work at the *Silver Bear* are reported by M. S. Davys, of Kaslo, to have been satisfactory, and it is anticipated that shipments of silver-lead ore will be resumed shortly. At the *Montezuma* a new bridge was constructed across Keen creek and shipments from the tailings-dump of the old mill were made by H. Giegerich.

Among other minor activities, work is reported to have been done at the *Flint* by J. A. Carter, at the *Kaslo* by J. E. Slawson, and by L. McLean on his properties.

*Properties tributary to Kaslo–Nakusp Railway.*

Whitewater.

This mine is owned and operated by the Whitewater Mines, Limited; authorized capital stock, 1,100,000 shares of common and 100,000 shares of preferred stock, par value $1. The preferred shares carry a first charge of $1 a share on dividends and when this is settled revert to common. W. H. Burgess, of Kaslo, is managing director. As the property is referred to in previous Annual Reports, only a brief review will be given. In order to have a clear conception of the outstanding features of this property it is first of all necessary to appreciate the locality of the present workings with reference to the upper workings and the surface and also to grasp the fact that there are two distinct types of ore-deposits in the same area.

That part of the mine in which the most important developments have taken place during the last two years is the lower section formerly covered by the claims of the *Whitewater Deep* company and since amalgamated with those of the present company. In these workings ore-bodies have been developed in virgin ground at a depth of 1,500 to 1,700 feet on the dip of the vein below the surface, with good indications that they will continue to a depth of at least 2,000 feet.

Of the two types of ore-bodies, one occurs in what is known as the main *Whitewater* vein, from the easterly section of which the production of the *Whitewater* was maintained for many years, representing an estimated gross value of $4,000,000. This ore was mined down to the tenth level. The *Whitewater* vein is a strong sheared fracture cutting the formation and striking easterly and westerly, with a dip of about 40° to the south.

The other type of ore-body represents replacement deposits in limestone-bands conforming to the dip and strike of the formation, which are respectively about 40° to the north-east and N. 30° W. The work of 1927 has added large ore reserves to the important tonnage indicated by the work done last year.

A development of outstanding importance has been the disclosure of ore in the main *Whitewater* vein in the virgin ground to the west of the old workings. It was first developed on the twelfth level and when examined in the fall of the year a drift had been advanced along this ore for 130 feet, near the end of which a crosscut exposed a width of 39 feet of good milling-ore. As far as could be ascertained by the amount of work done, its average width was about 10 feet. Later information received from the company at the end of the year is as follows: "Above the twelfth level we have opened a short drift on the eastern end of the west ore-body, showing it to be about 6 feet wide. From this point to the west face of No. 12 level, with the face still in ore, there is an ore-shoot 450 feet long, with an average width of at least 8 feet. We have drifted on this ore on the thirteenth level for over 100 feet, but have not here defined its length or width yet." This ore-body as developed in these workings lies at a depth of about 1,800 feet on the dip of the vein below its projected outcrop, while recent work on the fourteenth level indicates its probable downward continuation to this horizon.

The eastern end of the No. 11 level has been advanced for about 1,100 feet from the main raise to explore the downward continuation of the famous *Whitewater* ore-shoot. It is reported that some high-grade ore has recently been encountered between this level and the No. 10, also between the Nos. 10 and 9 levels, from which a good tonnage is expected. It is also reported that recent crosscutting from the easterly end of No. 11 has resulted in exposing a 4-foot width of ore in the hanging-wall side, which looks promising for the development of an important ore-shoot in this easterly section of the main vein.

As regards the replacement deposits which have already yielded a large tonnage of milling-ore, it may be said that these represent important ore-bodies from which a large tonnage may be expected. On the twelfth level a band of ore having an average width of 8 feet has been exposed along its strike for about 300 feet by drifting. This is underlain by another band which has been drifted on for about 80 feet and has an indicated width of from 6 to 15 feet. Exploration in this section was curtailed owing to shortage of power, the drills being needed in what was considered more important work at the westerly end of the twelfth level. It is thought that indications are favourable for the discovery of other important deposits of bedded ore in this section of the mine. The upper band above referred to has been encountered in the thirteenth level, where the drift showed a 12-foot width of good-grade ore. To sum up, it is quite evident that there is sufficient tonnage available to run the mill for a number of years, with excellent prospects of further important developments being made.

All the ore will be fed down the main raise to the fourteenth level, in which 45-lb. rails have been laid. A Mancha electric locomotive will be used to haul the ore to the mill. The concentrator, which was completed by the end of the year, was designed by W. L. Ziegler and its flow-sheet embodies the latest methods of concentration by oil-flotation. Like the other new mills, it is simple in operation and design.

From the mine storage-bin the ore is fed to a Blake crusher, 18 by 24 inches; thence by conveyor-belt to the mill storage-bin, from which it is fed to Traylor rolls; thence by elevator to a 6-foot Hardinge ball-mill in closed circuit with a Duplex Dorr classifier, the overflow from which goes to a 20-cell battery of M.S. machines. The resulting concentrates after passing through an American filter are fed by a belt-conveyor to the loading-bins at the railway-track.

Power for the mill is supplied by a 200-horse-power oil-engine, manufactured by the De La Verone Machine Company, of New York. This is a 2-cylinder horizontal engine. The mine compressor is run by water-power and it is thought that sufficient water-power can be developed eventually to run the whole plant.

During the year the company shipped 5,558 tons of ore, but shipments were curtailed as soon as it was decided to proceed with the construction of a mill.

As usual in this mine, leasers were busy in upper parts of the old workings and shipped 367 tons.

A considerable tonnage of tailings from the old *Whitewater* mill were reclaimed from the creek-bed and treated by the flotation plant of the Metals Recovery Company under the direction of M. S. Davys, of Kaslo. It is reported that highly satisfactory results have been obtained by a Forester flotation-cell. Latterly the concentrates produced have been running about: Silver, 34.5 oz. to the ton; lead, 4 per cent.; zinc, 49.7 per cent.

At the end of the year a new company was organized by the Pohlman Investment Company, of Spokane, and the *Wellington* group with adjoining claims to the west of the *Whitewater* were

acquired. Preliminary work was commenced at the end of the year, W. G. Harris being in charge. The name of the new company is the Wellington Mines, Limited, capitalized at $500,000, divided into 2,500,000 shares, of which 1,500,000 have been allotted.

Small-scale operations were carried on at the *Charleston*, adjoining the *Whitewater* to the north; at the *Monte Christo* by W. Myers and G. Johnson; at the *Caledonia* by G. E. McCready; and at the *California* by John Koski.

During the latter part of the year the *Jackson* mine was acquired by a new company called the Silver Basin Mines, Limited, in which, it is understood, Calgary capital is principally interested. W. G. Smith, who is in charge of the work, was busy in December making preparations for taking in supplies and putting a crew of men to work; no small undertaking, considering the great depth of snow through which a road had to be broken for about 6 miles.

List of Producing Mines, showing Tonnage shipped.

| Mine. | Locality. | Tons. | Character of Shipment. |
|---|---|---|---|
| Anderson | Kaslo | 29 | Silver-zinc-lead concentrates. |
| Banker | Ainsworth | 83 | Silver-lead-zinc ore. |
| Bluebell | Riondel | 18,838 | Lead and zinc concentrates, middlings. |
| Caledonia | Blaylock | 33 | Silver-lead-zinc ore. |
| Daybreak | Kaslo | 338 | Silver-lead-zinc ore. |
| Highland | Ainsworth | 395 | Silver-lead-zinc ore. |
| Lakeshore | Ainsworth | 40 | Silver-lead-zinc ore. |
| Lavina | Argenta | 73 | Silver-lead-zinc ore. |
| Metals Recovery | Blaylock | 14,070 | Zinc concentrates. |
| Monte Christo | Kaslo | 21 | Silver-lead-zinc ore. |
| Montezuma | Kaslo | 357 | Silver-lead-zinc ore. |
| Silver Hoard | Ainsworth | 25 | Silver-lead-zinc ore. |
| St. Patrick | Argenta | 1 | Silver-lead-zinc ore. |
| Whitewater | Retallack | 6,129 | Silver-lead-zinc ore. |

## REVELSTOKE, LARDEAU, AND TROUT LAKE MINING DIVISIONS.

In reviewing the season's activities in this northern part of the district, the fact that stands out predominately as signifying good possibilities for a new period of productive activity is that important preliminary work is being undertaken with a view to permanent operations by people who appear to be well able to finance their commitments.

In many cases transportation facilities have always been a severe handicap on account of the inaccessibility of the properties; while the amount of development that had been accomplished was insufficient to justify large expenditures in this direction. So, judging by present indications, the coming year should witness developments which will have an important bearing on the future of mining in this section of the district.

### REVELSTOKE MINING DIVISION.

**Snowflake.** This property, comprising a group of nine claims, was acquired during the year from the original owners, Gus Hedstrom and Ole Sandberg, by the Snowflake Mining Company, Limited, of Vancouver. The capitalization is $1,250,000, divided into 2,500,000 shares of 50 cents par value. J. B. Williams, of Vancouver, is president, and D. H. Lougheed is mine superintendent. The property is situated on Clabon creek, adjoining the *Woolsey* to the west and south. The mine camp, which is situated on a timbered hillside within a short distance of the workings, has accommodation for a crew of about sixteen men. The elevation of the camp is 5,400 feet (aneroid), or 3,300 feet above the railway, and is reached by a trail approximately 9 miles long.

In the vicinity of the workings the formation is composed of a dark slate, striking N. 50° W. and dipping at about 45° to the north-east. In the bluffs above the camp a strong quartz vein 15 to 20 feet wide is freely exposed for a considerable distance and conforms to the dip and strike of the formation. This in all probability represents the westerly continuation of the No. 5 vein of the *Woolsey*.

At an elevation of 5,900 feet the No. 1 tunnel had been driven into the hillside for 85 feet in a north-westerly direction, following a streak of clean galena in the slate on the foot-wall side of the main vein. The face of this tunnel was in mineralized ground which offered good possibilities for further prospecting, but work had been suspended as the ore showed a tendency to strengthen in the bottom; and as the latter end of the tunnel had been run at an adverse grade, it was decided to leave the exploration of this ground to be accomplished from the No. 2 tunnel.

From the No. 1 level 735 sacks of high-grade silver-lead ore had been extracted during the course of development and sacked for shipment. A sample taken of the sorted ore from some of the sacks assayed: Gold, 0.02 oz. to the ton; silver, 58.8 oz. to the ton; lead, 58.6 per cent.; zinc, 3.4 per cent. Another sample taken across a width of 6 inches of clean ore in the tunnel ran: Gold, 0.02 oz. to the ton; silver, 40.9 oz. to the ton; lead, 76.1 per cent.; zinc, 0.5 per cent.

The No. 2 level, which was being driven at an additional depth of about 50 feet, had been advanced for 126 feet in a direction of N. 22° E. with the objective of crosscutting the ore exposed in the No. 1 and the main quartz vein. It was estimated that this tunnel only had a few feet to go to reach its objective.

Following the outcrop of the main vein around the bluffs in a south-easterly direction, the No. 3 tunnel is reached in a horizontal distance of about 300 feet from the No. 2. Here there is evidence of cross-fracturing in the main vein and a short length of drift at a few feet below the surface in the foot-wall side had exposed a nice showing of clean galena and zinc ore along a length of about 15 feet, with ore in either face. The ore had a tendency to strengthen in the bottom of the drift and in one place showed a width of 30 inches of clean galena. It was the intention of the management to thoroughly prospect this promising showing by drifting and sinking.

Between this tunnel and the No. 1 the vein is strong and well defined. It is composed of massive quartz and carries a persistent streak of galena on the foot-wall side, and where fracturing has occurred it is mineralized with disseminations and occasional small pockets of galena, indicating that the galena is secondary to the quartz.

As yet not enough work had been done, in the writer's opinion, to allow an estimate being made of any important tonnage of milling-grade ore. During the year the results of shallow prospecting-work have been encouraging and demonstrated the presence of high-grade ore, fully justifying further development at depth. It is understood that during the winter months the company intends to drive a low tunnel which will gain a depth of approximately 600 feet on the vein.

Besides the main vein, there are others on the property which were not examined, but are said to offer good possibilities. The mine is well situated for economic production, and should ore be developed in sufficient quantity to warrant the equipment of the property for more extensive operations, the cost of transporting ore and supplies to and from the railway could be greatly lessened by improvements to the present trail and to the present facilities for handling the ore. Water is also available for power and milling purposes, while there is plenty of timber for mining requirements.

At the railway a siding was constructed during the year to facilitate the shipment of ore, of which 34 tons was shipped to Trail during the fall.

**Woolsey.** A small crew of men was employed at this property during the year by the Bernier Metals Corporation under the direction of R. F. Hill. Only a brief review of the conditions at this property will be given as it is described in previous Annual Reports. Work in the past has been principally confined to the development of one of a series of strong quartz veins lying parallel and conforming to the dip and strike of the formation. This is a strong, well-defined, massive vein, which has been traced for a considerable distance and is freely exposed in the vicinity of the upper workings.

It has been prospected by open-cut work and several tunnels and is known as the No. 5 vein. The No. 2 level, driven at an elevation of 4,395 feet, represents the most recent work on this vein and was started by the late Dave Woolsey, the previous owner. This tunnel has been driven in the foot-wall for 130 feet, in which distance two crosscuts have been advanced to the hanging-wall—one at 78 feet from the portal and the other about 40 feet farther in.

The first crosscut shows the vein to have a width of 23 feet, and, as stated in the Annual Report for 1919, "on the foot-wall side the mineralization is slight, but increases towards the hanging. A moiled sample of 30 lb. taken across a width of 9.5 feet adjacent to the hanging-wall ran: Silver, 6.6 oz. to the ton; lead, 6 per cent.; zinc, 6 per cent." The other crosscut exposes a strong width of quartz with little mineralization. On the surface above this tunnel there are several nice showings of clean galena on the foot-wall side of the quartz. Two trial shipments were made from here early in the year; one of about 3 tons averaged: Silver, 46.8 oz. to the ton; lead, 48.9 per cent.; zinc, 2.1 per cent.; and the other of about 2 tons gave: Silver, 33.6 oz. to the ton; lead, 28.5 per cent.; zinc, 2.1 per cent.

During the year a promising outcrop was exposed by surface prospecting on a parallel vein lying at about 35 feet to the foot-wall side of No. 5 vein at the No. 2 level, and known as the No. 6 vein. Here a width of about 5 feet and length of 15 feet had been laid bare by surface-stripping. A sample taken across 4 feet gave the following returns: Gold, 0.01 oz. to the ton; silver, 18 oz. to the ton; lead, 21.09 per cent.; zinc, 0.8 per cent. So little of the vein had been uncovered at the time of examination that no special significance could be attached to this showing, except that more work was justified to outline its extent and determine more definitely the nature of the occurrence.

Mineralization can be seen in numerous places on other parallel veins, suggesting that where the structural conditions are favourable for the reception of ore there should exist an important ore-body. In the writer's opinion the ore is secondary to the quartz and hence will be found to occur where channels have been provided by fracturing or in the slates adjacent to the quartz vein, which latter has been responsible for forming a channel for the mineral-bearing solutions.

In order to prove the vein system at depth and to explore the downward continuation of the ore exposed at the surface, a long crosscut tunnel was started last year at an elevation of 500 feet below the No. 2 tunnel. This has still 400 feet to go in order to intersect the downward projection of the No. 5 vein. Work was suspended at the end of last year pending the installation of a power plant. This plant was installed during the summer and consists of a 36/42 B.H.P. Vickers-Petters oil-engine and a 212-cubic-foot Holman compressor.

The camp buildings, which are conveniently situated to the workings, provide comfortable accommodation for a small crew of men and everything is in readiness for resuming operations at short notice.

**Wigwam.** At the *Wigwam* on Isaac creek an extensive diamond-drilling campaign was undertaken during the summer months, which is stated to have given satisfactory results. Altogether twenty-eight holes were put down, representing nearly 5,000 feet of drilling. The indicated width of the mineralized zone is said to be about 200 feet. The values, which are in silver-lead and zinc, are of low grade and the present work is being done in an endeavour to outline an ore-body of commercial importance. Capital is being provided by strong Tacoma interests, who have already spent a large sum on the exploitation of this property. It is understood that the property will be further explored and developed by underground work during the coming year. W. T. Dumbleton is in charge.

It is reported that the *J. & L.* group on Carnes creek, belonging to I. McBean, of Revelstoke, has been acquired by Regina interests and work at the property will be resumed next year as soon as snow conditions permit.

Up in the Big Bend country north of Revelstoke the French Creek Development Company had a crew of about sixteen men at work building a flume under the direction of F. N. Remillard. It is understood that about 3,000 feet of flume has been constructed and that next season will see its completion, when water will be turned on for hydraulicking the gravel benches of French creek, where it is claimed an old channel exists.

The Government road up the Columbia river has now been advanced as far as Carnes creek, a distance of approximately 27 miles from Revelstoke. This road will be of great benefit to all those having mining properties in the Big Bend and no doubt will lead to increased activity.

It is reported that the *Asbestos* group near Arrowhead has been acquired under option by the Lardeau Mines Exploration, Limited.

At the *Iron Cap* group at the head of 15-Mile creek J. P. Nelson and H. Sawyer, of Revelstoke, continued prospecting during the summer. The principal values are in copper. Reference to this property may be seen in the Annual Report for 1919.

## LARDEAU MINING DIVISION.

**Teddy Glacier.** This property was originally owned by F. R. Blockberger and associates, who it is understood have sold the control to Detroit capitalists, who are financing the development and equipment of the property. The mine-workings are reached by a trail 8 miles in length, which leaves the wagon-road at a point about 4 miles north of Camborne. This is a circuitous route which could be greatly shortened should conditions be found to justify improved transportation facilities. The upper end of the trail is well above timber-line and after traversing a glacial moraine for a mile or more finally arrives at the camp, which consists of a small cabin with a light framework covered with a heavy roofing-paper. This structure is situated on a barren but gently sloping hillside at an elevation of 7,500 feet above sea-level. As the property has been referred to at some length in previous Annual Reports, only a general summary of the impressions gained by the writer will be submitted.

The formation, consisting of slates, calcareous and greenish schists, strikes north-westerly and dips to the north-east. The softer and more fissile schists have been eroded by glacial action to form shallow gulches between rounded ridges of the harder rocks. The gulches were partly filled with snow and talus, while the surface of the ridges was freely exposed.

So far two impressive surface showings have been exposed on a gently sloping hillside at a short distance below the glacier which caps the summit of the ridge. At the lower exposure the ore shows the greatest strength and best grade where there is evidence of cross-fracturing and folding movements. It occurs in the form of a lens in a north-south fracture which cuts the formation. On the foot-wall side there is black argillaceous rock and on the hanging-wall a lime schist which is partly replaced by the ore, so it would appear that this deposit occurs in the limestone near the contact with argillites. On either side of this lens the fracture has been traced for a total distance of about 150 feet and shows an average width of about 2 feet.

A short length of tunnel had been driven at a vertical depth of 35 feet below the outcrop, but had not been advanced far enough to intersect the downward continuation of the ore. A sample taken across a width of 45 inches, which was considered to be the most highly mineralized section exposed at this outcrop, gave the following returns: Gold, 0.11 oz. to the ton; silver, 32.9 oz. to the ton; lead, 55.6 per cent.; zinc, 2.3 per cent. This probably represents the best grade of ore that could be sorted for shipment. The average run of the ore so far exposed carries a fairly high percentage of iron pyrites and quartz.

About 150 feet up the hill a similar exposure occurs in a parallel fracture, known as the Dunbar vein. In this vein pockets of disintegrated iron pyrites occur. A sample of this material assayed as follows: Gold, 0.60 oz. to the ton; silver, 2.3 oz. to the ton. The balance of the vein-filling carries a good percentage of lead and represents a desirable grade of milling-ore. This exposure occurs at the edge of the glacier which covers one end of it. As far as could be seen, its dimensions were similar to those of the lower lens—namely, about 35 or 40 feet long, with an average width of about 5 feet.

The small amount of prospecting which had been accomplished was not a very useful guide as to what could be expected with further development, and left doubt as to whether the north and south fractures represented the original ore-channel or whether the main channel was a fissure conforming to the stratification and following the gulch between the ridges, and therefore covered by debris. In the latter case the ore-bodies so far exposed would represent offshoots from the main vein along joint-fractures or possibly replacements in the least resistant beds. However, the strong surface showings fully warrant systematic exploration, which will soon throw light on the character of the ore-deposition.

Late in the season it was decided to equip the property with electric power and a site for a plant was chosen on Menhennick creek, where it is estimated 250 horse-power can be developed under a head of 350 feet. The power unit will consist of a high-speed Gilbert Gilkes turbine-wheel and generator. Power will be transmitted at 6,600 volts. The installation of the power-line, 7½ miles in length, was nearing completion at the end of the year, in spite of unusually adverse weather conditions and the rugged nature of the country. At the mine it is first intended to install a 50-horse-power motor and compressor, which equipment will be added to later on. The entire installation is being undertaken by Bartholomew, Montgomery & Co., of Vancouver.

A few men have been working at the mine during the winter and it is reported that the advancement of the short crosscut has exposed a good width of ore below the surface showing.

As soon as the plant is ready for operation, it is understood to be the intention of the owners to develop the ore-bodies by successive levels until sufficient tonnage has been blocked out to warrant the equipment of the property for early production.

**Sandy.** This group, consisting of four or five claims owned by F. R. Blockberger, is situated a short distance up Pool creek from Camborne. The mine cabin and workings are situated on the steep and thickly timbered hillside at an elevation of 3,750 feet above sea-level or about 700 feet above the creek. A well-defined quartz-filled fissure, which strikes N. 15° W. and dips at a steep angle, cuts a highly pyritized schist and has been drifted on for 72 feet. A small pocket of ore was encountered at a point near the intersection of a flat-dipping vein, the mineralization consisting of galena, zinc-blende, iron pyrites, and arsenopyrite. A sample of sorted ore gave the following returns: Gold, 0.14 oz. to the ton; silver, 38.1 oz. to the ton; lead, 26.5 per cent.; zinc, 9.2 per cent.

The face of the tunnel was in quartz mineralized with iron sulphides and oxides, the latter occurring in fractures which had allowed the circulation of water. A sample taken across 42 inches at the face gave the following returns: Gold, 0.03 oz. to the ton; silver, 0.6 oz. to the ton. With the small amount of work done, no definite conclusion could be arrived at as regards possibilities, but further prospecting appeared to be warranted.

**Alma.** This property, consisting of five claims and other groups of claims, has been acquired during the last two years by the Lardeau Mines Exploration, Limited, of Vancouver, and of which J. M. Humphrey is secretary and general manager. It is understood that the intention of this company is to further prospect properties which have been lying idle for some years with the object of turning them over to large operating companies or others capable of financing them to the producing stage.

During the year surface prospecting on this group was undertaken and a cabin built at the bottom of the trail leading up the mountain-side, at an elevation of 4,350 feet above sea-level. Work done so far indicates the presence of mineralization along the contact between limestone and schist and this can be traced from Poole creek over the summit of Lexington mountain towards Lexington creek. Along the strike of this contact ore has been exposed at intervals by open-cuts and trenches, but not enough work had been done at any one place to determine its continuity. The impression gained upon examination of the various exposures was that the mineralization replaced the limestone near its contact with schist and appeared to be strongest where flexures had provided channels for the solutions, and of little importance where there had been compression produced by tight folding.

The strike of the lime-schist contact is about N. 53° W. and dip 70° to the north-east. Following along this contact up the hill a number of exposures were examined, the most important of which are described as follows: At an elevation of 5,400 feet (aneroid), or approximately 1,000 feet above the valley-floor, a deep open-cut exposes a section across which a width of 4½ feet is well mineralized, but sulphide enrichment, consisting of lead, zinc, and iron sulphides in a gangue of lime-stone and associated with siderite, occurred at impregnations and was irregular. On account of the limited amount of work done and the character of the deposit, sampling across the face of this cut could not be taken as a criterion as to what might be expected in the next 5 feet. However, to gain information regarding the character of the ore and its silver ratio a sample was taken from a small pile of sorted ore; this gave the following returns: Gold, 0.03 oz. to the ton; silver, 16.4 oz. to the ton; lead, 35.6 per cent.; zinc, 27 per cent.

At an elevation of 5,475 feet another open-cut had been made at a slope distance of about 250 feet from the above described. Here there was evidence of tight folding and a little ore was exposed, but the limited amount of work did not allow any special significance to be attached to the importance of this showing.

At an elevation of 5,600 feet the width of mineralization as exposed was about 8 feet, the bulk of which would apparently represent a good grade of milling-ore, and the conditions appeared to hold good possibilities for further development with a view of at least determining the probable extent of this deposit, for at present the amount of work accomplished does not throw much light on what might be expected, either at depth or along the strike. Indications of mineralization could be seen in places along the contact farther up the hill to an elevation of 6,000 feet, which indicated justification for further prospecting.

From this property the trail leads over the summit (elevation 7,150 feet) to the *Kitsap*, which is owned by the same company. Here the mineralization follows apparently the same

contact, is similar in character and occurrence, and can be traced intermittently for a considerable distance. A few men were employed at prospecting; so far the results have been interesting but inconclusive. Further reference may be seen in the Annual Report for 1918.

Other prospecting-work in this vicinity was being done by this company on the *Utopia* and *Kismet* claims, which were formerly the *Lardeau King* and *Lardeau Queen*, also on the *Paymaster* on Incomappleux creek, at which latter a 209-foot crosscut is reported to have been driven. These properties were not visited by the writer.

Up near the head of Incomappleux creek the *Elizabeth* group was acquired by this company, the trail reconditioned, a bridge built across the creek, and everything is now in readiness to establish a camp and go ahead with development-work early next season.

Work was also done on the *Moscow* claim on Pool creek, where a prospect-tunnel had been driven for about 200 feet in a northerly direction along a sheared fissure in argillites at a short distance above the creek. Small pockets of ore had been encountered, but continuity was lacking as the ground was badly broken and disturbed, leaving doubt as to whether it was in place. It is possible that farther into the hill conditions may be more uniform. The only rock-exposures noticed were in the banks of the creek, the surface being heavily covered with overburden.

## TROUT LAKE MINING DIVISION.

**True Fissure.** This property is owned and operated by the True Fissure Mining and Milling Company, of Cincinnati. During recent years it is understood capital for development-work has been largely subscribed by G. F. Park, of Cincinnati. Since the property was examined last year a considerable amount of work has been accomplished; the lower or No. 2 level on the *Blue Bell* has been extended for about 700 feet, making the total length of drifting about 900 feet. In this length an ore-streak having a width of about 18 inches of zinc and a narrow streak of galena can be traced for about 50 feet and had been followed by a 168-foot raise to the No. 1 level. In the raise the ore pinches and swells to a maximum width of about 3 feet. On the No. 1 level the ore, consisting of a finely crystalline mixture of lead, zinc, and iron sulphides, shows a width of from 18 inches to 2 feet along a length of about 150 feet. Previous sampling of this ore indicated the following values: Gold, 0.08 oz. to the ton; silver, 22.5 oz. to the ton; lead, 9.7 per cent.; zinc, 26.9 per cent.

A sample taken across 18 inches near the foot of the raise on the No. 2 level gave the following returns: Gold, 0.04 oz. to the ton; silver, 2.3 oz. to the ton; lead, 0.4 per cent.; zinc, 55.4 per cent. The remainder of the drift on the No. 2 level discloses the vein-filling to chiefly consist of quartz, spathic iron, and iron pyrites. Near the face a little galena and zinc-blende were associated with the iron pyrities, but apparently not in sufficient quantity to constitute a commercial ore-body. A sample taken within a few feet of the face gave the following returns: Gold, 0.04 oz. to the ton; silver, 3.9 oz. to the ton; zinc, 11.4 per cent.

The workings on the *True Fissure* vein are at approximately similar elevations to those on the *Blue Bell*, but have been driven in a south-easterly or opposite direction. Both workings are apparently in the same mineralized zone, but are separated by about 500 feet of unexplored ground along the strike.

Of the two upper tunnels which have been driven to explore the downward continuation of the ore exposed at the surface, the lower or "C" tunnel gains a depth of 258 feet on the dip of the vein and the upper or "B" tunnel gains a depth of 125 feet.

The "C" tunnel has been driven for 520 feet in the hanging-wall side of the vein, with short crosscuts to the foot-wall at irregular and infrequent intervals. The work done discloses a strong fissure with a soft schist formation on the hanging-wall, which latter is well defined by a heavy streak of gouge. The mineralization, evidently occurring where there has been cross-fracturing, appears to be somewhat irregular in occurrence and consists of disseminated galena and zinc-blende, iron pyrites, and a little chalcopyrite in a gangue of quartz, spathic iron, and country-rock, and fades away into a foot-wall of highly silicified and pyritized green schist. In one of the crosscuts to the foot-wall the vein shows a width normal to its dip of 14 feet. A channel sample cut horizontally from foot-wall to hanging-wall gave a width of 19.7 feet, along which the samples taken in sections gave the following results:—

Across the first 3.4 feet from the foot-wall: Gold, trace; silver, 0.3 oz. to the ton; lead, 0.45 per cent.; zinc, 0.4 per cent.

Across the next 1.9 feet: Gold, 0.10 oz. to the ton; silver, 35.6 oz. to the ton; copper, 0.69 per cent.; lead, 25.4 per cent.; zinc, 13 per cent.

Across the next 4.6 feet: Gold, 0.06 oz. to the ton; silver, 26.2 oz. to the ton; copper, 1.01 per cent.; lead, 2.2 per cent.; zinc, 0.65 per cent.

Across the next 13.4 feet: Gold, 0.06 oz. to the ton; silver, 2.9 oz. to the ton; copper, 0.17 per cent.; lead, 2.5 per cent.; zinc, 11.2 per cent.

The continuity of this ore along the strike of the vein was not sufficiently explored to demonstrate its persistence Past this crosscut the main tunnel had been advanced for 350 feet and along the last 150 feet a streak of finely crystalline lead, zinc, and iron sulphides, having a width of from several to 12 inches, occurred on top of the hanging-wall streak of gouge. A sample of this ore ran: Gold, 0.19 oz. to the ton; silver, 16.2 oz. to the ton; lead, 25.1 per cent.; zinc, 21.2 per cent.

On the "B" level the upward continuation of the ore developed in the crosscut as described above was exposed along a length of about 15 feet of the drift to the face of the tunnel. A sample taken across a width of 3 feet at hanging-wall side and near the top of a raise from "C" level gave the following returns: Gold, 0.24 oz. to the ton; silver, 20.8 oz. to the ton; lead, 17.8 per cent.; zinc, 19.6 per cent. While a sample taken across 11 feet in a crosscut to the foot-wall yielded: Gold, 0.14 oz. to the ton; silver, 18.5 oz. to the ton; copper, 0.87 per cent.; lead, 8.5 per cent.; zinc, 17.1 per cent. This part of the mine apparently offers the best tonnage possibilities and is deserving of further development to prove more definitely the extent and character of the ore occurrences. The main tunnel on "C" level was being advanced at the time of examination.

Other work done in recent years to explore the downward continuation of the vein consists of a 750-foot crosscut driven at a vertical distance of 259 feet below "C" level. The fissure was intersected at 500 feet from the portal and drifted on under the upper workings for 650 feet, but so far results have not come up to expectations. It is understood that further work on this lowest level will be undertaken this winter. During the summer a road was constructed from Ferguson to the mine and it is reported that ore will be shipped during the winter months. Further reference may be seen in previous Annual Reports.

**Lead Stack.*** The *Lead Stack* group consists of the *Lead Stack*, *Howard*, and *Spruce Cabin* claims, owned by H. B. Morrison and C. O. Woodrow, and includes the claims of the former *Molly Mack* group. The examination on which this report is based was made in order to include the upper part of the property not previously visited. The property is located on Gainer creek, in the Trout Lake Mining Division, about 2½ miles by trail from shipping-point at Trout Lake.

The claims are situated on the north-western side of Gainer creek, following wide mineralized zones in altered silicified limestone and calcareous schists which strike north-westerly up the very steep mountain-side and over the summit of the ridge to the Bunker Hill Creek slope. Argentiferous galena is found in places throughout the area examined, which extends for a length of over 3,000 feet and through a vertical range of some 1,500 feet.

The elevation of the summit is about 5,400 feet above sea-level and the lowest working below the cabin, an open-cut, is at an elevation of about 3,900 feet (aneroid readings). The workings consist of shallow trenches, open-cuts, and a tunnel at the lower elevations, but at the upper end the bare rocks are exposed for a considerable distance. On the Gainer Creek side the slope of the mountain is nowhere less than 40° and towards the summit the ground is precipitous, making access to the showings hazardous without ropes.

In the mineralized zones, which are very wide and show remarkable continuity throughout the area examined, the calcareous rocks are heavily impregnated with iron oxides and carbonates and contain in places galena and pyrite occurring as replacement deposits. The mineralization is frequently associated with altered limestone containing considerable amounts of quartz occurring in stringers striking with and across the trend of the country-rock and in places forming typical stockworks. The ore occurs in bands, masses, and impregnations in the calcareous gangue, the general trend of the mineralization coinciding with the enclosing rocks.

Extensive systematic trenching and sampling would be necessary to get an idea of the values to be expected. Owing to the limited time available it was not possible for the writer to take samples representing definite widths. A composite grab sample of broken ore from a number of places along the outcrop assayed: Gold, 0.03 oz. to the ton; silver, 6 oz. to the ton;

lead, 30.1 per cent.; zinc, 2.2 per cent. Selected galena, containing a small amount of gangue, assayed: Gold, 0.02 oz. to the ton; silver, 19.1 oz. to the ton; lead, 75.5 per cent.; zinc, 1 per cent.

Towards the lower end of the property and on a level with the cabin there is a tunnel about 135 feet in length which is driven approximately parallel to the strike of the country-rock. This tunnel would have to be extended in a north-easterly direction to crosscut the mineralization exposed on the surface.

The extensively distributed mineralization in the iron-stained exposures indicates favourable possibilities for the development of tonnage of ore of milling grade, and in this respect the *Lead Stack* compares favourably with other prospects being investigated by companies in search of new reserves of lead ore. The claims are situated in a mineralized limestone-belt in which similar ore has been found at intervals for a length of several miles, the work done up to the present being limited to shallow surface-digging. It is not improbable that systematic exploratory work in this mineral-belt will prove important concentrations of ore where special geological conditions exist.

The deposits on the *Lead Stack* can be developed by tunnelling through a vertical range of some 1,500 feet and the steepness of the ground allows of good backs being obtained for every foot of advance. Water-power for mining and milling could probably be developed economically in the vicinity of the property, timber for mining purposes is convenient and plentiful, and transportation facilities would no doubt be improved in proportion to the importance of the operation.

The above report was made under the provisions in aid to prospectors under subsections (*a*), (*b*), and (*e*) of section 10 of the "Mineral Survey and Development Act."

**Lardo Gold Silver Mines, Ltd.***

During the year this company, with registered office in Calgary, was formed to acquire and operate the *Butte*, briefly described on page 234 of the Report of the Minister of Mines for 1923. The property, which is situated in Bonanza basin, 6 miles by trail from Gerrard, at that time consisted of the following seven claims owned by the late J. G. Jenkins: *Butte, Butte Fraction No. 1, Butte Fraction No. 2, Bonanza King, Harlock, Gallant Boy,* and *Prince of Wales.* Jenkins died intestate a year or two later and subsequently the property was purchased from the Official Administrator at Kaslo by R. H. Graves (secretary of the Bullock Gold Mines, Limited). It is reported that Graves, who obtained a transfer of the property which was not recorded, gave a transfer of the above claims to Bannerman & Begg, of Calgary. These parties had a company incorporated in Alberta under a Dominion charter, but up to the end of the year had not complied with the formalities necessary to own and operate mining property in British Columbia. According to the official records, six of the claims still stand in the name of the J. G. Jenkins Estate, no transfers having been recorded, and as the miner's licence for this estate was not renewed following the sale of the property to Graves, all title to the six claims was apparently relinquished.

The *Prince of Wales* was allowed to expire, but was subsequently relocated as the *Haskins* and a bill of sale given to the Lardo Gold Silver Mines. Towards the end of the year the first-mentioned six claims of the original Jenkins property are reported to have been restaked by a party, who was a shareholder and employee of the company, to safeguard his interests. Since the property was visited in 1923 the work done by J. G. Jenkins up to the time of his death included a shallow shaft and a short tunnel.

**Silver Tray.***

A small amount of work was done by J. Parisian and associates on the *Silver Tray*, situated on the Trout Lake slope a few hundred feet below the summit of the divide leading to Bonanza basin. The formation is composed of schists and metamorphosed sedimentary rocks. The work done, consisting of a few hundred feet of tunnelling and some deep trenching, was undertaken with a view to finding the source of detached masses of silver-lead ore found on the surface. As yet nothing definite in the way of a vein has been found in the workings, the principal one of which is a tunnel about 200 feet long, driven in crushed argillaceous rocks containing inclusions of quartz.

**Fidelity.***

A small amount of work was done by J. Gallo on this property, which is situated on the eastern side of Trout lake, 3 miles by trail from Gerrard, the elevation being about 6,800 feet. The workings develop quartz veins, mineralized with pyrite, galena, and a little zinc-blende, in a schist formation. The ore contains values in gold, silver, lead, and zinc. The only production recorded for the property, which is described in the Report for 1914, is as follows:—

Twenty-five tons of sorted ore shipped in 1912–13, assaying: Gold, 0.22 oz. to the ton; silver, 52.7 oz. to the ton; lead, 45.1 per cent.; zinc, 1.8 per cent. 23.86 tons of sorted ore shipped in 1912–13, assaying: Gold, 0.18 oz. to the ton; silver, 70 oz. to the ton; lead, 61.2 per cent. Ten tons of sorted ore shipped in 1912–13, assaying: Gold, 0.26 oz. to the ton; silver, 58.1 oz. to the ton; lead, 51.4 per cent. Six tons of sorted ore was shipped in 1918 for which no values are given.

Development-work done this year includes 100 feet of crosscutting and drifting and some deep open-cutting.

Among other activities the following have been reported: George Yuill, of Trout Lake, put in a season's work at the *Free Coinage*, which adjoins the *Silver Cup* to the south. At the *Mohican* on Gainer creek work was confined to the advancement of the low tunnel to intersect the projected downward extension of the ore exposed in the old upper workings. It is understood that this work was done under contract by C. L. Copp.

At the *Abbott* on Healey creek a 400-foot crosscut was driven under contract by Dave Morgan for E. B. Brauns, of Michigan, to tap the downward continuation of the ore-body; results are not known at the time of writing. Further work is also reported to have been done at the *Big Five* north of Ferguson by G. B. McMillan, at the *Blue Jay* by Victoria interests, and at the *Magnet* by Alex. McLean and associates.

List of Producing Mines, Revelstoke, Lardeau, and Trout Lake Mining Divisions, showing Tonnage shipped.

| Mine. | Locality. | Tons. | Character of Shipment. |
|---|---|---|---|
| Snowflake (Revelstoke) | Albert canyon | 34 | Silver-lead-zinc ore. |
| Woolsley group (Revelstoke) | Albert canyon | 5 | Silver-lead-zinc ore. |
| Multiplex (Lardeau) | Camborne | 28 | Silver-lead-zinc ore. |
| True Fissure (Trout Lake) | Lardeau | 2 | Silver-zinc-lead ore. |

## NELSON MINING DIVISION.*

The year under review has witnessed a marked increase in the activities of this Division, with new developments which give promise of stability.

Near Ymir the operations at the *Yankee Girl, Goodenough*, and *Howard* properties have been very encouraging and open up entirely new possibilities for the camp.

Mining properties and prospects near Ymir on which work was done include the *Yankee Girl, Goodenough, Hunter V., Dewey*, and *Howard*. The *Yankee Girl, Hunter V.*, and *Goodenough* contributed substantially to the shipping-list.

In the district tributary to Salmo the most important activities are: Development-work done at the *Aspen* by the recently formed Salmo-Malartic Mines, Limited; resumption of work at the *Queen* and *Kootenay Belle* properties; the acquisition of the *H.B.* mine by the Consolidated Mining and Smelting Company and the exploratory work done by the same company on the *Mona*, the two last-mentioned properties being in the Pend d'Oreille limestone-belt. It is also reported that the *Molly Molybdenite* on Lost creek was diamond-drilled in the spring by the Consolidated Mining and Smelting Company.

On Erie creek there was resumption of work at the long-dormant *Second Relief* and *Arlington*, where small mills were erected, and the Consolidated Mining and Smelting Company continued diamond-drilling exploration of the gold-copper deposits near Green City.

Near the International Boundary exploratory work in the Pend d'Oreille mineral-belt was continued by the Victoria Syndicate and a small amount of work was done by Spokane interests on the *Red Bird* on the opposite side of the river.

Near Ginol Landing on Kootenay lake a small amount of work was done on some old properties acquired by the Associated Mining and Milling Company and the United Lode Mining Company in 1926. The companies have received considerable publicity in promotional literature, but the situation remains much the same as when the properties were abandoned many years ago.

Near Nelson work was done at the *Euphrates, Fern, Silver Reef, True Fissure, Alma N.*, and *Queen Victoria*. The *Molly Gibson* on Kokanee creek was operated by leasers during the early part of the season and subsequently diamond-drilling was done by the Consolidated Mining

and Smelting Company, which owns the property. Other minor activities in the Division include a small shipment from the *Alice* at Creston and some work done at the *Leadville* near Kitchener. Near Creston G. A. M. Young and J. E. Hayden report that interesting exposures of sulphide ore, carrying values in silver, lead, and zinc, were made while prospecting this season at the *Delaware* on Arrow creek.

Towards the end of the year negotiations were proceeding for the acquisition by Eastern capital of several properties in the Ymir and Sheep Creek gold camps and other deals are reported to have been made in other parts of the Division, so that an exceptionally active year is anticipated.

### Ymir District.

**Yankee Girl.*** The *Yankee Girl* is situated about 2 miles by road from Ymir, on the eastern side of the Salmo River valley. An aerial tram connects No. 4 level with ore-bins at the railway-tracks and No. 2 level is connected by baby aerial tram with No. 4 level. The *Yankee Girl* group includes the following Crown-granted claims: *Yankee Girl, Klondyke Fraction, Black Diamond, Yukon Fraction, Canadian Girl,* and *Lakeview.* The elevation of the lower tunnel (1,235-foot level) is 3,618 feet above sea-level or a little over 1,200 feet above the railway at Ymir.

Previous references to the *Yankee Girl,* which include descriptions of its history and former development, are contained in the Annual Reports of the Minister of Mines for 1915 and 1920 and in Geological Survey of Canada, Memoir 94, "Ymir Mining Camp," by C. W. Drysdale. The property is now being extensively developed by the Porcupine Goldfields Development and Finance Company, Limited, which during 1927 took an option on the controlling interest.

The Yankee Girl, Limited, which still retains a substantial interest, acquired the property early in 1926, since when the mine has been successfully operated on a shipping basis, approximating 1,500 tons a month. New possibilities for important tonnage have been shown to exist. The property has been thoroughly sampled, so that extent and grade of developed ore-bodies are well established and checked by mine shipments.

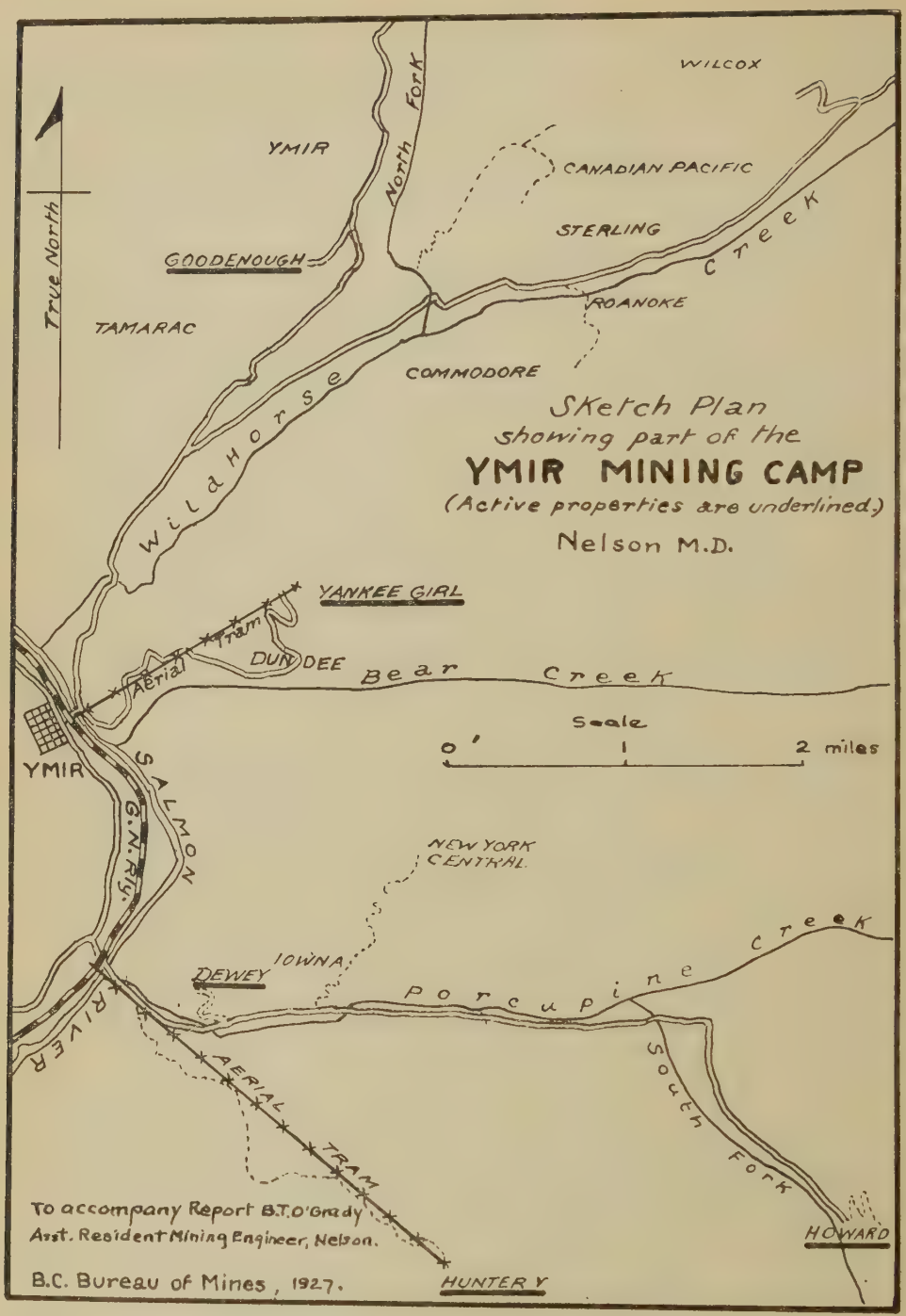
The formation, which is described in detail in the previous Annual Reports referred to above, consists of Pend d'Oreille schists cut by granitic tongues from the Nelson batholith. The ore consists of auriferous pyrite accompanied by galena and zinc-blende in a gangue of quartz and altered wall-rock, the principal values being in gold. Cutting diagonally across the trend of the Pend d'Oreille schists, there appears to be a zone of fracturing forming vein systems rather than simple veins, ore being found in various fractures and sometimes between them. The general strike of the veins is north-east by east, with steep north-westerly dips. The localization of the ore-bodies is at, or adjacent to, acute-angled intersections of the fissure-veins with the granitic tongues, the rake of the ore-shoots being apparently nearly vertical.

The *Yankee Girl* fissure, on which most of the work has been done, includes a hanging-wall vein and a foot-wall vein which are up to 20 feet apart, but sometimes come together, forming wide ore-bodies in places. A small amount of work has been done on spur veins which branch out from the *Yankee Girl* vein and on the *Lakeview* vein, which cuts the *Yankee Girl* vein at an acute angle.

The underground workings in the aggregate amount to over 2½ miles in length. Ore has been proved by tunnelling to a depth of 1,235 feet below the surface, and by diamond-drilling this summer ore has been found at a vertical depth of 250 feet below the lowest tunnel. The 540- and 1,235-foot levels comprise the main development. The two levels are now connected by a raise, recently completed, through the McDowell ore-body.

The principal development has been done on the Hobson ore-shoot above the 540-foot level and on the McDowell ore-shoot between the 1,235- and 540-foot levels. Stopes on these ore-bodies have accounted for most of the production of the mine. A small amount of stoping has been done on the *Yukon* ore-shoot and on spur veins.

The dimensions and shape of the better-grade ore-shoots developed in the former operations is indicated on the accompanying illustration, which also shows approximate areas stoped to the end of the year. The width of the ore-shoots is from 6 to 20 feet. At the 800-foot station in the raise through the McDowell ore-body 30 feet of ore is exposed where the foot- and hanging-wall veins come together.




The operations of the Yankee Girl, Limited, proved that the exploratory work done in the past was not carried out to full conclusions. Foot- and hanging-wall country in the ore-bearing areas was not sufficiently prospected as has been recently shown in many places in the McDowell ore-body, where increased widths of ore have been exposed in former workings and new bodies of ore discovered paralleling those already known. Lateral exploration to the eastward on the

540- and 1,235-foot levels was discontinued just as it was approaching a favourable area on the *Lakeview* vein.

Vertical exploration downward on the Hobson ore-body below the 540-foot level was not previously undertaken in spite of the fact that its stope-length of 35 feet at the Overland (50-foot) level increases to 200 feet at the No. 2 tunnel level.

The McDowell ore-body was not explored below the 1,235-foot level although it is good at that level. Neither was its upward extension tested on the 540-foot level and above. The *Yukon* ore-body was cut on the 540- and 1,235-foot levels and a little stoping done, but nothing more.

Economic conditions and smelting schedules existing at the time may account for such lack of completed exploration. The changed conditions compelled serious attention to the new possibilities.

The chief work done by the Yankee Girl, Limited, and latterly by the Porcupine Goldfields Company, has been the vertical and lateral exploration of the McDowell ore-body, from which the bulk of the ore shipped by them has been derived.

Briefly summarizing the results of the development of the McDowell ore-body since operations were commenced by the Yankee Girl, Limited, it may be said that the known width of ore was materially increased and that vertical and lateral exploration has proved continuity of the ore, indicating the existence of much larger ore-bodies than were thought to exist.

In connection with this exploratory work, exceptionally good ore was recently developed in the easterly drift on the 800-foot level. According to the management, sampling shows this ore to assay: Gold, 1.25 oz. to the ton; silver, 8 oz. to the ton; lead, 12 per cent.; zinc, 14 per cent., over an average width of 3 feet for a length of 112 feet.

Another interesting feature of the new work was the opening-up on the 1,035-foot level of a new fissure or spur vein which has since produced ore over a good stoping width.

No new work was done on the Hobson ore-body, but diamond-drilling by the Porcupine Goldfields Company in the foot-wall country on the 1,235-foot level struck ore in a series of short holes, indicating the downward continuation of this ore-body, thus presenting new ore possibilities of importance.

The principal ore-bearing area comprising the Hobson and McDowell ore-bodies is about 1,000 feet long. Wherever lateral and vertical exploration has been done in this area, mineralization in varying degree has been encountered, the boundaries of the ore being more of a commercial than physical nature. Fluctuations of values make a great deal of sampling necessary and tonnage estimates will vary according to the grade of material which it will be found possible to mill at a profit. Hitherto only the better-grade ore, which would stand shipment to smelters, has been produced.

In addition to the Hobson, McDowell, and *Yukon* shoots, favourable ore possibilities exist in spur veins and in the *Lakeview* vein, which at the easterly end of the 1,235-foot level is approaching a granitic area, and a sample across 7 feet in the face assayed: Gold, 0.32 oz. to the ton; silver, 1.5 oz. to the ton.

Stoping experience gained in 1926 and 1927 shows that it is safe to increase previous estimates of the ore reserves in the McDowell ore-body by at least 50 per cent., due to greater average width, lateral and vertical extensions.

Reserves of developed and probable ore above the 1,235-foot level have therefore been greatly increased and further possibilities for important tonnage extensions have been indicated by diamond-drilling in the ore-bearing areas on and below the 1,235-foot level.

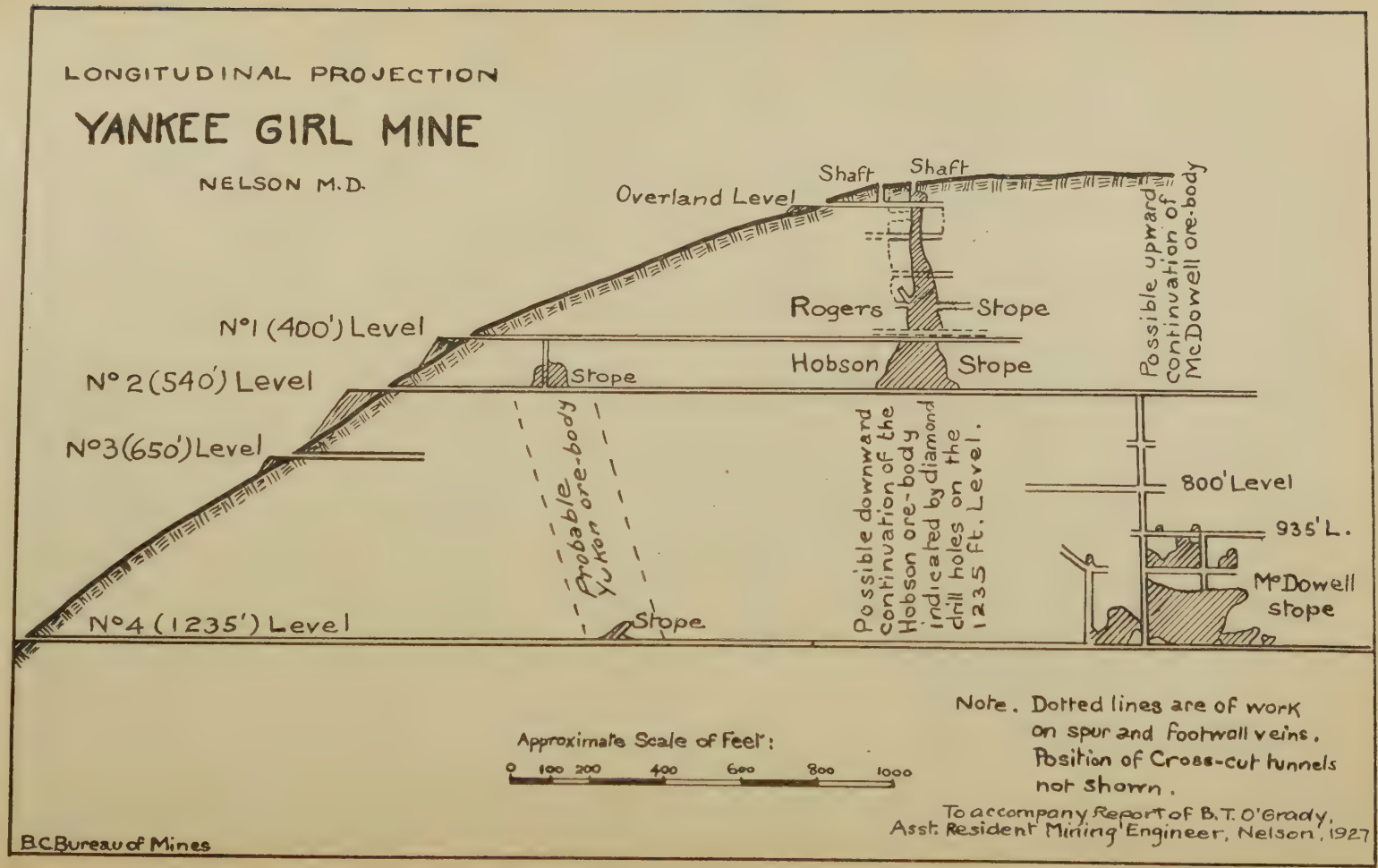
According to a conservative estimate, there is a good possibility of developing 500,000 tons of ore above the 1,235-foot level, without taking into consideration ore possibilities of spur veins and the *Lakeview* vein, and a vigorous plan of development is now being pursued with a view to putting sufficient ore definitely in sight to justify installation of milling plant. The reduced cost of operation and the increased profit would then enable the operators to mine ore of a lower grade than has hitherto been produced.

Approximate estimates of past production, supplied by the management, are as follows:—

Hobson ore-body: Above 540-foot level and prior to 1913, 12,800 tons.

McDowell ore-body: Between 1,235- and 935-foot levels from 1913–26, 10,900 tons.

McDowell ore-body: Same area in 1926–27 by Yankee Girl, Limited, milling, 16,333 tons; smelting, 20,093 tons.

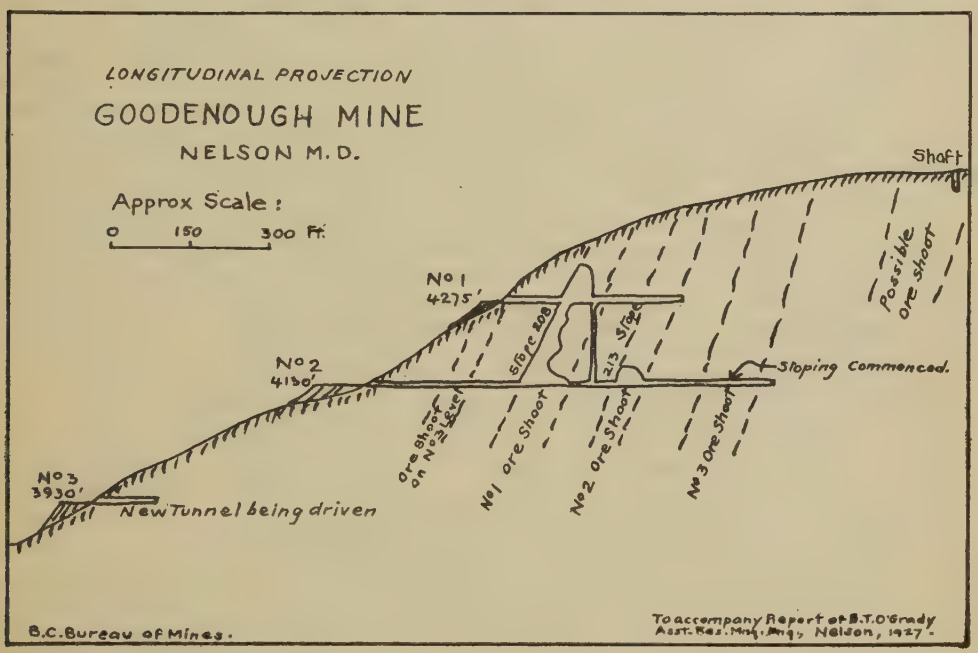

LONGITUDINAL PROJECTION
YANKEE GIRL MINE
NELSON M.D.
Overland Level
Shaft
Shaft
Possible upward continuation of McDowell ore-body
Rogers
Stope
N°1 (400') Level
N° 2 (540') Level
Stope
Hobson
Stope
N°3 (650') Level
Probable Yukon ore-body
Possible downward continuation of the Hobson ore-body indicated by diamond drill holes on the 1235 ft. Level.
800' Level
935' L.
McDowell stope
N°4 (1235') Level
Stope
Approximate Scale of Feet:
0 100 200 400 600 800 1000
Note. Dotted lines are of work on spur and footwall veins. Position of Cross-cut tunnels not shown.
To accompany Report of B.T. O'Grady, Asst. Resident Mining Engineer, Nelson, 1927
B.C. Bureau of Mines

Dump ore, mainly from the McDowell ore-body: Shipped in 1926, 11,000 tons.

The bulk of the total production of the mine, amounting to 71,126 tons, has gone to smelters as a gold-silver ore, but towards the end of 1926 most of the tonnage has been sent to the custom flotation-mill at Trail. The average gross value of all ore shipped to date, which represents the total area stoped, is estimated at between $15 and $18 a ton.

The mine, which is thoroughly equipped in every respect, is very favourably situated for economic and efficient operation. At the time of the writer's visit a crew of about forty men was employed.

**Goodenough.*** This property, consisting of the *Goodenough* (Crown-granted), *Damariscotta*, *Protection*, and *Little Nell*, is situated on the north-western side of Ymir creek and adjoins the *Ymir* to the south-west. The property is connected by wagon-road, 4½ miles in length, to the Great Northern Railway at Ymir. According to Geological Survey of Canada, Memoir 94, "Ymir Mining Camp," the *Goodenough* was staked in 1898, when




a shipment of 20 tons, said to have assayed $22 a ton, was made. In 1899 the Ymir Gold Mining Company took an option on the property and some shallow surface prospecting was done with indefinite results. Subsequently the property came into the hands of the present owners, who, after doing a small amount of tunnelling which disclosed good ore, bonded it to the Porcupine Goldfields Development and Finance Company in 1926. This company drove No. 1 and No. 2 tunnels with a connecting raise, which, including crosscuts, amounted to some 1,770 feet of development-work.

Two diamond-drill holes were also put down, cutting the veins 80 feet below No. 2 level, which is approximately 380 feet below the outcrop of the vein. The Porcupine Goldfields Company also shipped some eight cars of ore taken out in development during September and October, 1926, which are reported to have netted $13,500, or $34 a ton, after deducting freight and treatment. Shortly afterwards this company relinquished its bond and in the spring of 1927 the property was again bonded by H. Jackson, O. A. Lovell, A. MacDonald, and associates to O. D. Frith and associates, who subsequently formed the Goodenough Mines, Limited, of Nelson. Operations were started on July 15th and the first car of ore was shipped on July 23rd, 1927. Since then production has been maintained continuously at the rate of about 300 tons a month.

The ore consists of auriferous pyrite accompanied by zinc-blende and galena in a highly siliceous gangue, the principal values being in gold. The formation is composed of Pend d'Oreille schists intruded by granitic tongues from the Nelson batholith. Cutting diagonally across the

country-rocks, the fissure-veins strike north-easterly, with steep dips to the north-west. The original shallow surface workings indicated two distinct veins, about 90 feet apart, which converged towards the south-west.

In the underground workings, however, there appears to be a shear-zone 30 to 40 feet wide, in which numerous cross-veins branch out at intervals from the two main quartz-filled fractures which are situated on the hanging- and foot-wall sides of the shear-zone. Granite is in evidence at numerous points in the two tunnels and the better-grade ore-shoots are apparently localized at or near the granitic intersections. Faulting in the plane of the vein has taken place on more than one occasion as evidenced by various fracture and gouge zones, offsetting of dykes, slickensides, and the elongated lenticular shape of the ore-shoots.

At least four ore-shoots, from 40 to 100 feet long, are indicated in the underground workings and another shoot may possibly be developed when the workings reach the expected downward continuation of ore said to be exposed in one of the two shafts on the surface which are caved and inaccessible. These shafts are reported to have been sunk 60 and 40 feet deep. The north shaft is said, on good authority, to have shown 11 feet of good mill-ore at the bottom.

The lenticular ore-bodies, which vary in width from a few inches to 7 feet, are intersected by numerous faults, generally causing small offsets. Movement on the east of the faults has been to the northward. Lamprophyre dykes interrupt the continuity of the mineralization in places, but their influence is only local and the veins are not materially affected. The only appreciable throw is caused by a fault which has displaced the western part of the veins in the tunnels.

Development consists of surface cuts, two shafts, and three tunnels. No. 1 tunnel, at an elevation of 4,275 feet and 220 feet on the dip of the vein below the surface, has been driven north-easterly about 340 feet. The first 135 feet, driven by the owners, follows the hanging-wall side of a sheared fault-fracture filled with crushed argillites. Towards the end of this part of the tunnel high-grade ore was encountered which attracted attention to the property and was responsible for subsequent development.

The results of the development on the No. 1 level, which, including some 140 feet of crosscutting, amounts to about 480 feet, were somewhat indefinite and it was not until the No. 2 tunnel was driven that the real character of the deposits began to be realized.

The No. 2 tunnel, at an elevation of 4,130 feet, is 800 feet in length. Including crosscuts, development on this level amounts to about 1,182 feet. No. 2 tunnel is connected with No. 1 by a raise 154 feet in length put up on the hanging-wall side of the shear-zone.

The two tunnels are also connected by a raise through No. 208 stope (No. 1 ore-body). The results of work done on the No. 2 level have proved definite parallel quartz-filled fissures on hanging- and foot-wall sides of a wide sheared zone which strikes N. 60° E. to N. 75° E. and dips at 65° to 75° to the north-west, with numerous mineralized cross-veins which run diagonally between the main fractures. The ore-shoots rake steeply to the west. From where the veins were first encountered mineralization in varying degree is continuous to within about 160 feet of the face, where a wide lamprophyre dyke occupies the tunnel for a length of some 40 feet. Beyond the dyke the vein is picked up again and in the last 100 feet of the tunnel good ore is developed where the vein intersects granitic dykes.

A small amount of stoping of a selective nature has been done on the No. 1 ore-body in both tunnels and on the No. 2 ore-body in No. 2 tunnel. Towards the end of 1927 stoping was started on the No. 3 ore-body in No. 2 tunnel.

Up to the end of 1927 shipments amounted to 1,306 dry tons, which netted $23,413.68 after paying freight and treatment. The total metal content of this ore was as follows: Gold, 923 oz.; silver, 6,523 oz.; lead, 86,500 lb.; zinc, 88,945. It was found more advantageous to ship this production as direct smelting-ore on account of the bonus on the high silica content, which varied from 64 to 73 per cent. and more than made up for the loss of and any penalty on the zinc content.

The average assay computed from 1,270 tons, including shipments made in 1926 by the Porcupine Goldfields Development and Finance Company, was: Gold, 0.9 oz. to the ton; silver, 7.3 oz. to the ton; lead (dry assay), 4.6 per cent.; zinc, 7 per cent. Freight rates average about $2.10 a ton and the haulage charges on the ore varied from $1.25 in summer to $1.50 a ton in winter.

The calculation of tonnage possibilities is difficult. There are numerous exposures of ore in the two tunnels, but the character of the deposits is somewhat irregular and does not lend itself to the usual blocking-out methods. A recent conservative estimate of probable and possible ore indicated in the present workings amounts to 12,475 tons of a gross value of $191,000. A much larger tonnage of possible milling grade, however, is indicated.

During December shipments were increased to about one car-load a day, for which smelter returns were not available at the time of writing.

Towards the end of the year a new adit, or No. 3 tunnel, giving an additional depth of 220 feet on the vein, was started and driven a short distance.

The operations to date show a substantial profit, which is exceptional for a property in this stage of development, especially as the tonnage was chiefly derived from development-work.

The acquisition and subsequent development of the property by the Goodenough Mines, Limited, is due to the initiative of O. D. Frith, manager, who had charge of the property when it was being operated by the Porcupine Goldfields Company.

The *Goodenough* deposits are so situated that they can be developed at depth by tunnelling, with all attendant advantages of cheap mining and natural drainage. The future of the property would seem to depend on the development of sufficient ore reserves to justify the installation of milling plant.

The equipment consists of a 250-cubic-foot gasoline-driven Ingersoll-Rand compressor, with pipe-lines to the faces of the three tunnels. The camp buildings include two bunk-houses and a cook-house with facilities for accommodating thirty to forty men, blacksmith-shop, etc. Ore-bins have been erected at the mine and railway-tracks.

At the end of the year negotiations were completed for the introduction of working capital, assuring a vigorous plan of development in 1928.

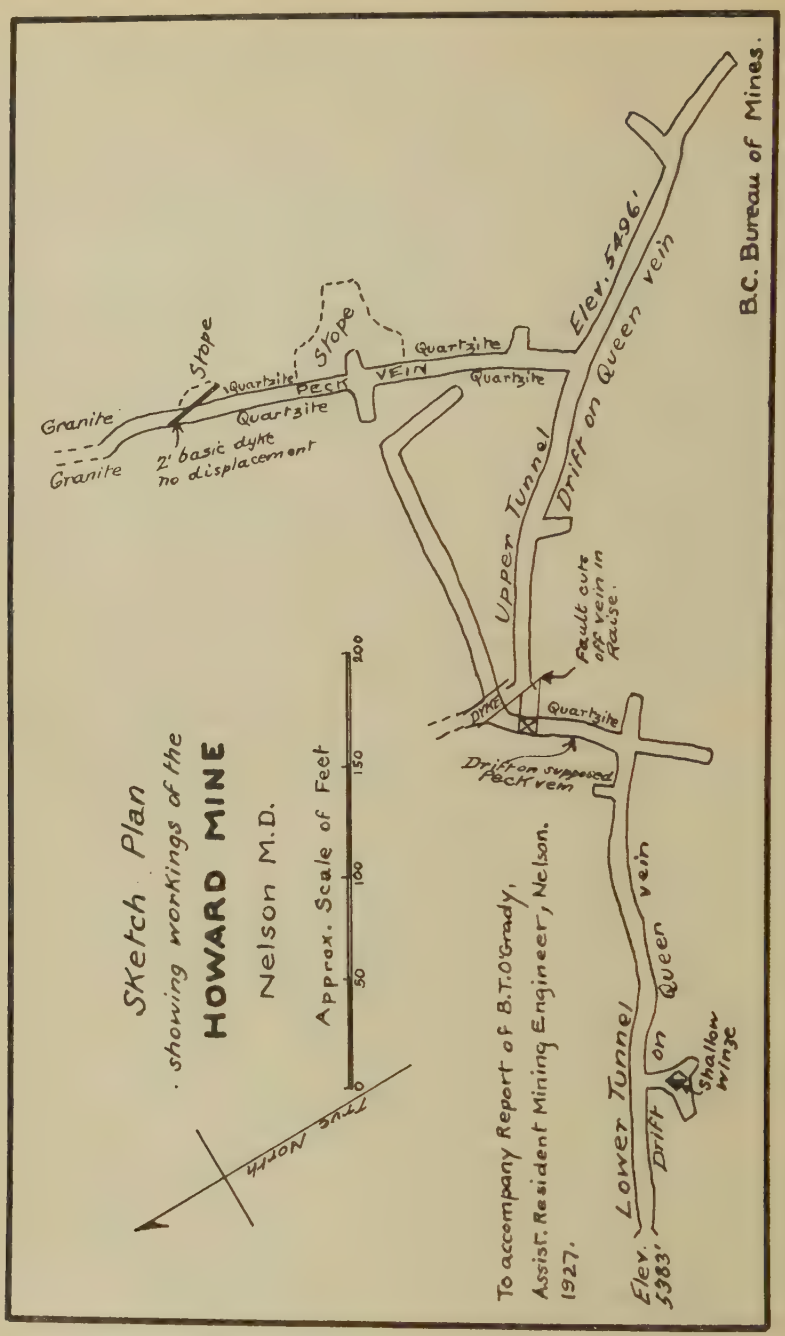
**Hunter V.*** On Porcupine creek the *Hunter V.* mine has been operated continuously on a shipping basis of from 50 to 75 tons a day. The Consolidated Mining and Smelting Company owns the property, which is on the divide between Porcupine and Hidden creeks at an elevation of about 5,700 feet above sea-level and is accessible by means of a switchback trail from the Porcupine wagon-road. The deposits consist of replacement of limestone, in which the fine-grained sulphides, galena, zinc-blende, and pyrite, carrying values in silver and a little gold, occur disseminated in a carbonate gangue. Occasional native silver is found in small flakes.

The limestone, which is limited on the east and west by belts of Nelson granite, belongs to the Pend d'Oreille group and has a general north-and-south trend. The limestone is not pure and in the vicinity of the ore carries considerable silica. The deposits, which are low grade and fluctuate considerably in value, are chiefly valuable for fluxing purposes.

Until the year 1925, when work was resumed by the Consolidated Mining and Smelting Company, the property had been dormant for many years, the production having been limited to requirements of the smelters for flux such as it produced. During the year a new aerial tram was erected from the mine to ore-bins at the railway. Some thirteen men are employed.

**Dewey.*** A brief description of this property, on which a small amount of work has been done, is contained in the Annual Report for 1926. The property, owned by the Chloride Mining and Milling Company, of Waverley, Wash., is situated on the northern side of Porcupine creek, about a mile from the Great Northern Railway. The ore, which consists of auriferous pyrite, galena, and zinc-blende, with occasional copper sulphides, in a calcareous gangue, is found in a vein in altered sedimentary rocks of the Pend d'Oreille group. A small amount of work was done during the summer months under the management of E. Campbell. A 1-drill compressor and gas-engine were installed and two men were employed driving a tunnel.

**Howard.*** This property consists of the *Howard*, *Paddy*, *Glencoe*, *Lochiel*, *Prince Charlie*, and *Contact* claims, comprising the original *Howard* group and the *Doolittle*, *X.10.U.8*, and *Skookum* staked this year. The claims are situated on the eastern slope of the South fork of Porcupine creek, the distance from the compressor plant at the foot of the hill to the Great Northern Railway at Porcupine Siding being about 6 miles by the old wagon-road. The mine is connected with the compressor plant by a good new trail 1½ miles in length. The elevation of the lower tunnel and mine cabins, according to survey, is 5,383 feet, or about 3,000 feet above the railway.



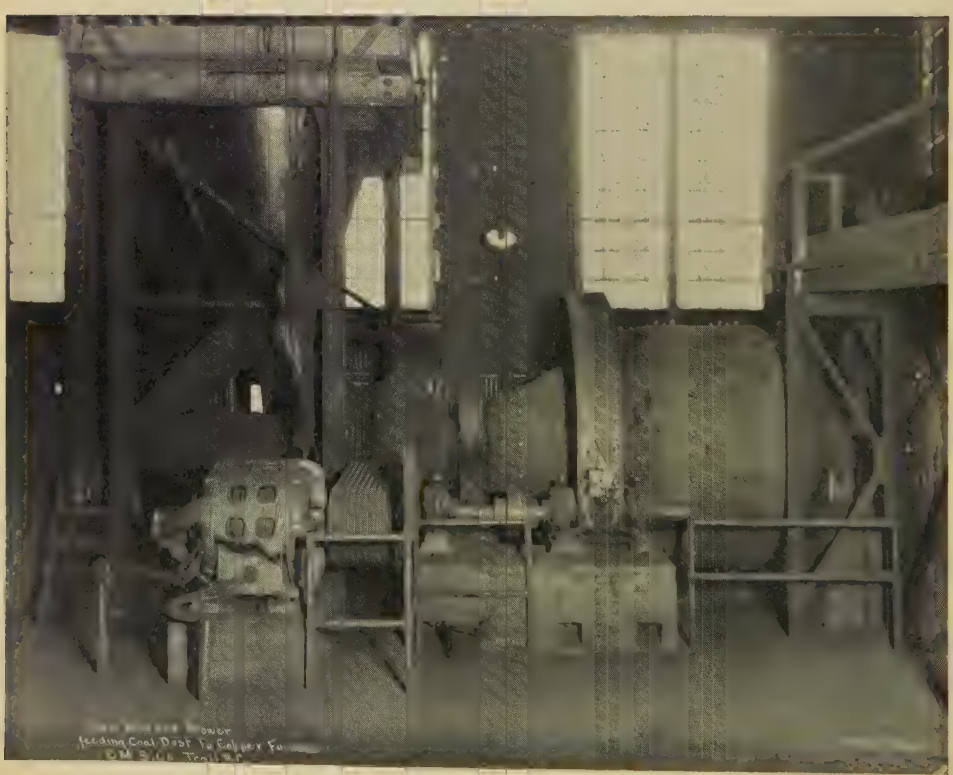

The *Howard* was bonded in 1926 by D. A. Cameron to J. H. Pomeroy, of Portland. Substantial cash payments have been made and considerable development-work has been accomplished under the management of J. W. Peck, who has an interest in the property.

The Annual Report for 1926 contains a description of the property as it was when acquired by the present operators. Briefly summarized, the position then was that nothing definite had been found in the old workings, which developed fissure-veins striking easterly up the hill. Since then new discoveries have been made which open up new possibilities for the property.

Yankee Girl Mine, Nelson M.D.

Consolidated Mining and Smelting Co. of Canada—Trail Plant.

Trail Smelter—Copper Reverberatory Furnace.



Trail Smelter—Blower and Ball-mill, Copper-furnace.

Credit for these discoveries is due in the first place to Dougald Cameron, who, ably assisted by his wife, did the preliminary pioneering work, which directed attention to the possibilities of this old property with which he had been associated during former operations. This preliminary work included the commencement of the crosscut in the upper tunnel which led to the discovery of the "Peck ore-body."

The formation of the area consists of schists, quartzites, and argillites intruded by granitic tongues and stocks of the Nelson batholith. On Drysdale's geological map of the Ymir camp (Map 175A, Geological Survey of Canada) the formation surrounding the property is shown as entirely consisting of granite. This may be accounted for because the *Howard* is located in an outlying section of the map area. In the text of accompanying report, Memoir 94, it is stated that the property, then known as the *Union Jack*, was not visited.

Some of the rocks of the *Howard* roof-pendant resemble members of the Pend d'Oreille group as described by Drysdale in other parts of the map area, but it is possible that they belong to the older Summit series. The point is one of some importance which cannot be determined without careful geological study.

Hitherto most of the important deposits of the Ymir area have been found in the contact injection zones between the rocks of the Pend d'Oreille group (tentatively referred to the Cambrian or Post-Cambrian) and the Nelson granitic batholith. Little, if any, importance seems to have been attached to the economic possibilities of the contacts between the granite and the Summit series of Pre-Cambrian age.

In Chapter IV., "Economic Geology," Memoir 94, Drysdale says: "No deposits have been found in the Summit series, although the gold-quartz veins of the neighbouring Sheep Creek camp occur in the southern extension of that series." If the rocks in which the *Howard* deposits occur are found to belong to the Summit series, interesting new possibilities are indicated for the sections of country lying along the eastern and southern margins of the Ymir map area, which have only been very slightly prospected as compared with the central portion of the camp.

On taking over the management of the property some crosscutting was done by J. W. Peck in the old upper and lower tunnels on the *Howard* claim, which disclosed replacement ore in quartzite running about at right angles to the fissure-veins. This new ore-body strikes from N. 20° E. to N. 35° E. and dips to the north-west from 40° to 50°.

As the ore-body dips with the hill, the slope of which is about 35°, and was encountered 170 feet in from the portal of the upper tunnel, considerable "backs" can be expected. The ore-body might be described as a "blind" lead which has been protected from erosion by the overlying strata. Granite is in evidence at several points in the workings and in part at least the Peck vein follows the contact between it and the quartzite.

Two minette-like intrusive dykes were noted in the workings, one in each tunnel, both striking about N. 10° W. and cutting the Peck vein at acute angles. The dyke in the upper tunnel, about 1½ feet wide, crosses the vein at about 176 feet from the main tunnel, but the ore is undisturbed by it and it has no apparent economic significance. The dyke in the lower tunnel, however, has cut off the ore-body. This faulting will be referred to again when the lower tunnel is described hereafter.

The ore consists of pyrite, pyrrhotite, galena, and zinc-blende, with occasional chalcopyrite, in a siliceous gangue and carries values in gold, silver, lead, and zinc. Small percentages of nickel are associated with the pyrrhotite. Some fine specimens of free gold associated with the sulphides have occasionally been found. The Peck ore-body, in so far as developed, has been thoroughly sampled and a good idea of the grade of the ore has been obtained.

A description of the surface showings of the *Howard* claim is contained in the Annual Report for 1926. Briefly summarized, there were some small showings of ore in two parallel south-easterly striking fissure-veins known as the Queen and Queen No. 2 veins, the distance between them being about 30 feet.

The upper or No. 1 tunnel, at an elevation of 5,496 feet, follows the more northerly of the two veins, or Queen vein, for a length of about 325 feet. Some indefinite mineralization was encountered in places in this tunnel, the small amount of ore exposed being "lensy," probably due to shearing movements which are indicated by numerous striations on the rock-surfaces.

At a point about 170 feet inside the portal of this tunnel, where the strongest indications of mineralization were encountered in the old working, Peck drove a tunnel north-easterly and struck ore almost immediately, which was followed for some 200 feet along quartzite to the

granite. This ore, known as the Peck vein, averages over 6 feet in width. The full width of the ore, however, is not exposed in the tunnel and in places short crosscuts show mineralization up to 12 feet wide.

In the granite at the end of the drift the ore narrowed to 2½ feet. When the property was last visited the face of the drift showed well-defined lines of fracturing with streaks of oxidized decomposed material.

A very conservative assay plan made from samples taken at 5-foot intervals throughout the first 200 feet of the Peck vein in the upper tunnel shows an average assay of: Gold, 0.294 oz. to the ton; silver, 1.46 oz. to the ton; lead, 1.4 per cent.; zinc, 8.4 per cent., over an average width of 6.2 feet.

Nine samples taken at 25 foot intervals by F. A. Thomson, of the University of Idaho, gave an average assay of: Gold, 0.65 oz. to the ton; silver, 2.73 oz. to the ton; lead, 5 per cent.; zinc, 10.2 per cent., over an average exposed width of 5.3 feet.

All the above sampling was done before any stoping was done. When stoping was started towards the centre of the ore-body, higher values were encountered in ore consisting chiefly of heavy alternating bands of galena, zinc-blende, and pyrrhotite. When last seen the stope was about 50 feet long, 35 or 40 feet up from the level, and well mineralized throughout. Samples from this ore-body assayed as follows:—

| Description. | Gold. | Silver. | Lead. | Zinc. |
|---|---|---|---|---|
| | Oz. to Ton. | Oz. to Ton. | Per Cent. | Per Cent. |
| Across 53 inches on hanging-wall side at southern end of stope just above level | 0.57 | 4.0 | 5.5 | 20.1 |
| Across 57 inches on foot-wall, adjoining last sample across 53 inches | 0.11 | 2.5 | 5.4 | 11.3 |
| Across 6 feet on hanging-wall side, southern side of stope about 15 feet above level | 0.98 | 9.9* | 24.6 | 9.5 |
| Grab sample of broken ore in stope, possibly representing 100 tons | 0.71 | 5.3 | 12.1 | 10.0 |
| Pile of roughly sorted ore (fines omitted), about 75 tons, outside portal | 1.04 | 8.2 | 21.3 | 21.8 |
| Big pile of ore in tunnel, foot of stope | 0.86 | 8.2 | 23.6 | 24.5 |

* And nickel, 0.52 per cent.

The lower or No. 2 tunnel, at an elevation of 5,383 feet, apparently follows the Queen vein throughout most of its length, which is about 250 feet. Only short segments of sparsely mineralized bands of quartz were visible in it and nothing definite was exposed. Peck did some crosscutting to the north-east at a point about 20 feet back from the face and, as in the upper tunnel, struck ore in the first few rounds. The mineralization shows the same characteristics and has a similar strike and dip as in the upper tunnel and is in all probability the downward continuation of the Peck ore-body. The ore was followed for some 60 feet to where it is cut off by a basic, minette-like dyke 8 to 9 feet wide which strikes N. 10° W. and dips steeply to the east. This dyke, which strikes the vein at an acute angle, also cuts off the ore at the top of a raise 35 feet up from the level.

A considerable amount of tunnelling was done on the level with a view to finding the ore-body beyond the fault. This work was apparently done on the assumption that a downthrow had been caused, but as the displacement is probably small the throw would not be sufficient to reach the level, and, assuming that the fault is normal, the vein might be expected to be found in a short distance by continuing the raise on a flatter angle.

The assay plan, previously referred to, shows an average assay of: Gold, 0.187 oz. to the ton; silver, 1.92 oz. to the ton; lead, 2.9 per cent.; zinc, 7 per cent., over an average width of 4.5 feet and a length of 60 feet. A grab sample from a pile of some 40 tons of ore outside the portal of the lower tunnel derived from the 60-foot drift and raise assayed: Gold, 0.92 oz. to the ton; silver, 6.1 oz. to the ton; lead, 13.4 per cent.; zinc, 11.5 per cent.

When the property was last visited in October some 500 tons of the heavy sulphide ore had been extracted from the stope in the upper tunnel with a view to making a shipment to Trail. Before shipping, however, a few hundred pounds of this ore was sent to Trail, and the settlement sheet, based on Schedule H, received by the owners from the Consolidated Mining and

Smelting Company of Canada gave the following assay and analysis: Gold, 1.01 oz. to the ton; silver, 7.4 oz. to the ton; lead (wet), 17.4 per cent.; zinc, 13.1 per cent.; sulphur, 25 per cent.; silica, 27.7 per cent.; iron, 14.8 per cent.; lime, 1.1 per cent.

Subsequently it was decided not to ship the ore as the management considered better results could be obtained by a vigorous plan of development with a view to assuring a supply of ore of good average grade for a mill on the ground.

In addition to the very promising Peck ore-body north of the Queen vein, there are several other interesting possibilities for finding ore. In the first place, it would seem that the ore-bearing band of quartzite should be picked up on the south side of the main tunnels beyond the possible faulting influence of the Queen vein.

Then the Queen and Queen No. 2 veins offer possibilities for ore as indicated by the surface showings and spots of ore in the main tunnels. In the No. 2 tunnel there is several feet of good ore in the bottom of a shallow winze in the short south-westerly crosscut 60 feet from the portal. A little water in the winze prevented a sample being taken across a definite width, but a grab sample from a small pile of ore derived from the winze assayed: Gold, 0.28 oz. to the ton; silver, 19.6 oz. to the ton; lead, 20.7 per cent.; zinc, 13.3 per cent.

Good assays can also be obtained on the surface in places along the trend of the outcrop of the Queen and Queen No. 2 veins. These surface showings warrant systematic exploration by trenching and open-cutting.

Towards the end of the year a new tunnel is reported to have been started which will gain a depth of about 125 feet on the No. 2 tunnel.

Preliminary surveys have been made for an aerial tramway to connect with a proposed mill-site. The length of the proposed tram is 3,085 feet, in which distance the fall is 1,160 feet. The installation of a mill during the coming season is contemplated and the present temporary compressor equipment will be replaced.

If development proves up to expectations the *Howard* property will open up new possibilities for an outlying section of the Ymir camp, in which little interest has been taken for many years.

**Canuck.*** Adjoining the *Howard* property to the north-east, four claims known as the *Canuck*, *Cariboo*, *Sunrise*, and *Eyry* have been staked by D. A. Cameron. The *Eyry* is staked on the extension of the Queen fissure-vein north-easterly from the *Paddy* of the *Howard* group. The other three claims are located southerly from the *Eyry*. The claims have not yet been visited, but according to the owner, who located and sold the *Howard*, he has done some surface-stripping at intervals for a length of 450 feet on a vein on the *Cariboo* which averages 4½ feet in width and carries good values in silver and lead in places.

**Rainy Day.*** Another recent discovery was made in the vicinity of the *Howard* by J. Thexton, who staked some claims southerly from Porcupine creek at a point about a mile easterly from its junction with the South fork. The discovery, reported to have been accidental, was made just before snowfall and it was too late to make an examination of the property this year. Some ore from the *Rainy Day* inspected by the writer consisted chiefly of zinc-blende and iron oxides apparently occurring as replacement ore in limestone. This ore assayed: Gold, 0.14 oz. to the ton; silver, 0.6 oz. to the ton; lead, 2.1 per cent.; zinc, 15.6 per cent. Higher-grade ore is reported to have been found by the owner.

### Sheep Creek Camp and South of Salmo.

The general geology of the area is shown on the "Sketch Map of Sheep Creek Mining Camp," published by the Geological Survey of Canada in 1909. The district embraces two distinct types of ore-deposits, one consisting of gold-bearing quartz veins and the other of lead-zinc replacement deposits in limestone. To the first class belong the *Reno*, *Queen*, and *Kootenay Belle*, alluded to below, and the *Nugget-Motherlode*, *Yellowstone*, and others described in previous Annual Reports, the ore-bodies occurring in fissure-veins cutting rocks of the Summit series, usually the quartzite.

The period of the greatest activity of the camp was between 1900 and 1915, when the bulk of the gold production was made, and the Annual Report of the Minister of Mines for 1915 contains a very useful summary of development and production. Since 1915 there has only been intermittent activity in the area, which suffered from the adverse conditions for gold-

mining prevailing over a long period. Useful information regarding this gold-bearing area is also contained in the Summary Report of the Geological Survey of Canada for 1908.

To the second type of deposits belong the *Aspen*, *H.B.*, and *Mona*, to which reference is made below, and other mines and prospects, including the *Hunter V.* (referred to under "Ymir District"), *Black Jack*, *Lucky Boy*, *Emerald* (described in previous Annual Reports), and the McDonald-Reeves and *Red Bird* (referred to under "Pend d'Oreille River Section").

Together these properties trace a mineralized zone characterized by the occurrence of the Pend d'Oreille limestone along or near intrusive granitic rocks, extending in a direction southwest by south from the *Hunter V.* to the International boundary, a distance of roughly 17 miles. On the United States side of the boundary the extension of the same mineral-belt is marked by the property of the Pend d'Oreille Lead and Zinc Company, the *Grand View*, *Electric Point*, *Gladstone*, and other properties. It is only comparatively recently that serious attention has been directed to the important economic possibilities of this mineral-belt.

In addition to the work done on the properties separately described below, there was some prospecting activity along the trend of the Pend d'Oreille limestone-belt between Sheep creek and Lost creek. Some diamond-drilling was done during the spring on the *Molly Molybdenite*, owned by the Consolidated Mining and Smelting Company, and the *Silver Dollar* at Salmo is reported to have been taken under lease and bond by L. Clubine, who did a small amount of work towards the end of the year.

**Aspen.*** The *Aspen* group consists of the following six Crown-granted mineral claims: *Aspen*, *Emma*, *Mohawk*, *International*, *Caroline*, *Silverton Fraction*, and the following mineral claims held on location: *Broken Hill*, *Aspen Nos. 1*, *2*, *3*, and *4*. In the fall of 1927 the property was turned over by P. F. Horton, representing the owners, to the Salmo-Malartic Mines, Limited, of Toronto, which company is now developing the property with a crew of fifteen men.

The *Aspen* is situated on Deer creek, about midway between the *Hunter V.* and *H.B.* properties, owned by the Consolidated Mining and Smelting Company of Canada, Limited, and is connected with shipping-point at Salmo by a road 11 miles in length.

The *Aspen* deposits occur in silicified limestone strata of the Pend d'Oreille group, tentatively referred to the Carboniferous or Cambrian period, near the contact of intrusive granitic rocks of the Nelson batholith. The old workings are described on page 170 of the Annual Report of the Minister of Mines for 1917.

Some years ago a 10-ton shipment to the Trail smelter from superficial workings of an exploratory nature assayed: Silver, 60.4 oz. to the ton; lead, 2 per cent.; zinc, 3 per cent.

In the fall of 1926 new discoveries were made on the *Mohawk* several hundred feet below the upper zone, where the previous work had been done. At an elevation of about 4,350 feet (aneroid reading) trenching exposed mineralization in a band of silicified limestone over 100 feet wide lying between two granitic intrusions. The trend of the mineralized zone is north-westerly and south-easterly and the dip of the limestone strata is to the north-east.

The deposits are apparently chiefly of replacement type, though there is evidence of contact metamorphism in places. The associated minerals are chiefly galena, zinc-blende, occasional specks of chalcopyrite and pyrite. The gangue is altered country-rock.

The new workings consist of open-cuts and trenches and a crosscut tunnel 75 feet in length. For the first 10 feet of the approach the tunnel crosscuts hard acidic granite; then cuts 20 feet of decomposed granitic material of more femic character. Throughout the last 45 feet the tunnel crosscuts a fractured zone consisting of alternate bands of mineralized limestone and decomposed micaceous dyke material, the latter resembling heavy gouges.

The limestone is mineralized with bands, stringers, and disseminations of the lead and zinc sulphides, small percentages of which are found in the decomposed material between. A grab sample from a pile of ore taken from the last 8 feet of the tunnel assayed: Gold, 0.02 oz. to the ton; silver, 8.5 oz. to the ton; lead, 24.2 per cent.; zinc, 6.6 per cent.

The results of the small amount of work done are very encouraging and indicate possibilities of a discovery of importance. Camp buildings consisting of a cook-house, bunk-house, blacksmith-shop, and stables are in course of construction at the time of writing.

Since the writer visited the property, early in November, the crosscut tunnel is reported to have been driven as far as the second granite-contact, showing continuity of the mineralization

over a considerable width. Before the contact was reached the management reported that ore of different character was encountered which consists of disseminated grey copper, chalcopyrite, galena, and occasional native silver in a calcareous gangue, containing good silver values. At the end of the year a small compressor plant was being installed.

**H.B.*** This property, situated on Deer creek, about 2 miles south of the *Aspen*, was operated by P. F. Horton, one of the owners, during the summer months and some fifteen car-loads of lead carbonates were shipped to Trail. The mine, which has been extensively developed, produced a considerable tonnage, chiefly consisting of oxidized zinc ore, between 1914 and 1917, when high prices for zinc prevailed. Recently the property was purchased by the Consolidated Mining and Smelting Company.

**Black Jack.*** This property, adjoining the *H.B.* to the south, was briefly described in the Annual Report of the Minister of Mines for 1926. No work has been done on the *Black Jack* during the present year, but through the initiative of P. F. Horton the Black Jack Merger Mining Company was formed to acquire and operate the property. The company, with registered office at Salmo, is financed by Los Angeles capital. Development-work is due to start during the coming season. The surface showings consist of zinc-blende occurring as replacement deposits in limestone strata of the Pend d'Oreille group.

**Reno Gold Mines, Ltd.*** The property of the Reno Gold Mines, Limited, situated at the head of Fawn creek, consists of the following sixteen Crown-granted mineral claims: *Red Rock*, Lot 12680; *Latham*, Lot 12683; *Donnybrook*, Lot 12685; *Reno*, Lot 12684; *Clarence Fraction*, Lot 13041; *Dandy*, Lot 12682; *Clarence*, Lot 13042; *Curlew*, Lot 12681; *Triune*, Lot 13043; *Manhattan Frac.*, Lot 13038; *Gartan*, Lot 13040; *Black Stone*, Lot 9055; *Lynx*, Lot 13039; *Blue Stone*, Lot 9054. There are, in addition, the following three claims held by location: *Larkhall*, *Cassiar Fraction*, and *Milwaukee*. The property is connected by roads with Salmo, on the Great Northern Railway, the distance being about 13¾ miles.

Numerous references to the *Reno-Donnybrook* property are contained in former Annual Reports of the Minister of Mines and the object of the following report is to bring the information up to date by including the work done since the last reference in 1923.

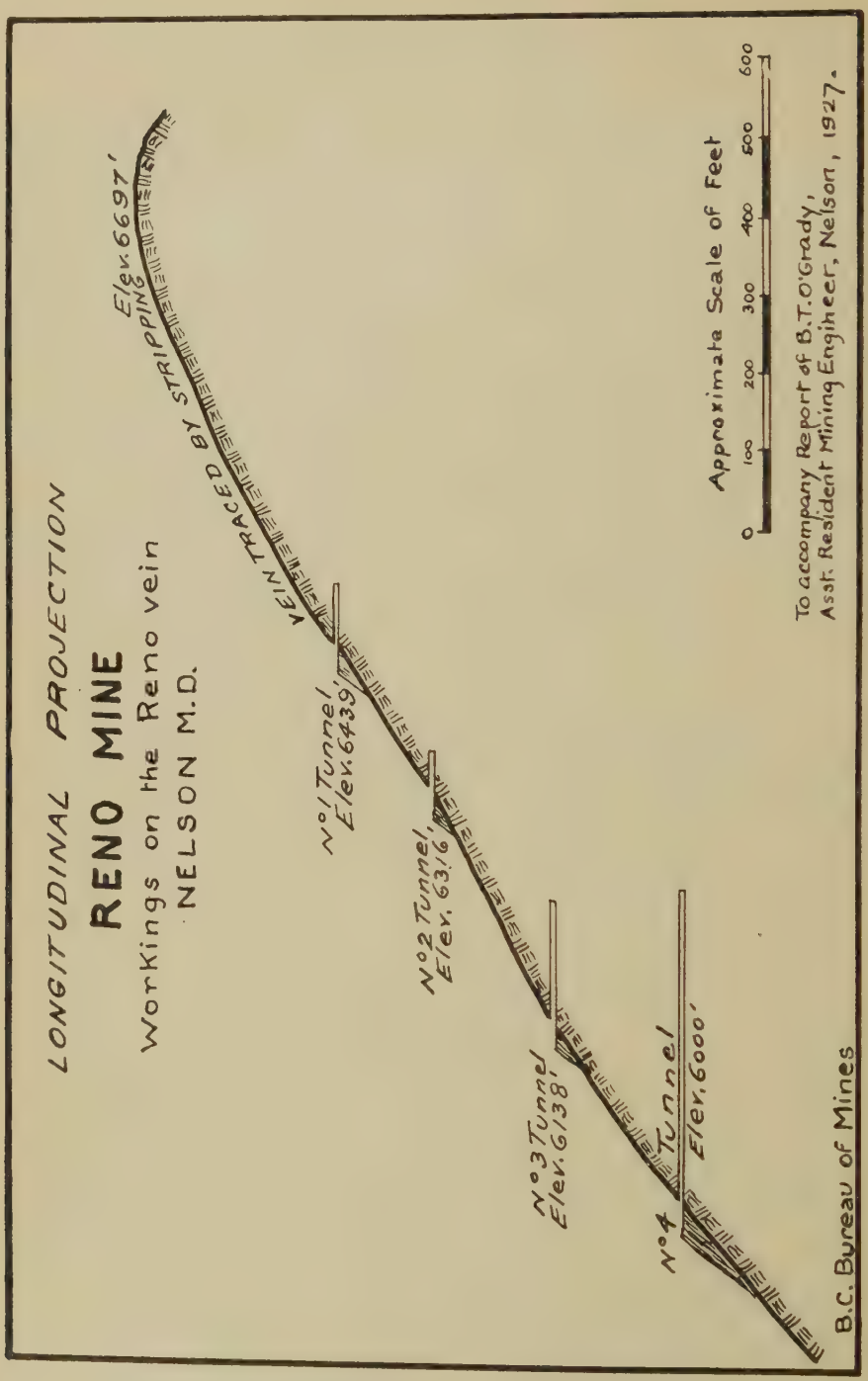
The formation, consisting of quartzites and schists, belongs to the same geological series as that of the Sheep Creek gold area, in which are situated the *Motherlode*, *Nugget*, *Queen*, *Kootenay Belle*, and others. These rocks were classified as the Summit series by R. A. Daly and O. E. Leroy, of the Geological Survey of Canada, as shown in their "Sketch Map of Sheep Creek Mining Camp," published in 1909.

On the *Reno-Donnybrook* groups, the amalgamation of which forms the present property, there is a series of approximately parallel gold-bearing quartz veins, striking up the steep hillside in a north-easterly direction, which vary in width from 1 to 6 feet. The average slope of the hill is about 30°. The general strike of the rocks is about N. 12° E., with a dip of about 50° to the east, and the veins are of the true fissure type, cutting the formation at angles varying from 50° to 60°. The dips of the veins approximate the vertical, but in places dip slightly to the south.

The vein-filling is quartz with occasionally a little quartzite. Metallic sulphides are almost completely absent and the ore consists of free gold, frequently visible to the naked eye, in a gangue of quartz stained with iron oxide and leached and decomposed quartz.

Extending from the Hidden Creek slope to the Fawn Creek slope, the known veins are named: The Lake, Clarence, Donnybrook, No. 3, No. 1 (or Reno vein), No. 2, and Crescent veins. South of the Crescent vein rich float has been found over a considerable area, indicating the presence of another vein or veins. Most of the development-work has been done on the No. 1 or Reno vein, this work being briefly as follows:—

The outcrop of the vein is developed by four tunnels, numerous open-cuts, and stripping for a length of approximately 1,400 feet through a vertical range of 700 feet. The elevation of the summit of the ridge is 6,697 feet above sea-level, according to Green Bros. & Burden's plan, from which all the elevations mentioned have been taken. From the summit down to the upper or No. 1 tunnel the vein has been traced by open-cuts and stripping for a length of over 600 feet. The vein-exposures in the open-cuts were mostly covered with rock debris from sluffing-in of sides of the workings, but the dumps of ore and occasional exposures show that the vein was traced throughout and that it is well mineralized and contains high-grade pay-streaks in places.




On account of the limited time available no attempt was made to systematically sample the vein-outcrop and only a few samples were taken to get an idea of the gold-tenure of different types of ore.

Just below the summit of the ridge a sample from a 12-inch pay-streak consisting of green-stained, slightly oxidized quartz assayed: Gold, 1.02 oz. to the ton. Farther down the hill and

about midway between the summit and the No. 1 tunnel a 10-inch pay-streak consisting of quartz heavily stained with iron oxide assayed: Gold, 3.82 oz. to the ton; silver, 1.1 oz. to the ton.

The No. 1 tunnel, at an elevation of 6,439 feet, followed a vein from the surface in a northeasterly direction which was at first supposed to be the main vein. At 24 feet in from the portal the tunnel branches and one fork continues along the vein first encountered for 30 feet. This vein, which is about 18 inches wide and consists of decomposed material containing iron oxides and occasionally a little quartz, has a strike of about N. 58° E. instead of the usual strike of the main vein, which is about N. 80° E. A sample of iron-stained decomposed material from this vein assayed: Gold, 0.47 oz. to the ton. The other branch of the tunnel is driven S. 80° E. for some 90 feet. Little ore is developed in it, but quartz is visible in the south wall of the tunnel wherever it has been broken into. A little crosscutting is necessary to clear up the situation on this level, so that the vein may be clearly exposed and development-work continued. Neither branch of the tunnel follows the true strike of the vein, the strike of the first mentioned being too northerly and the strike of the second too much to the south. It is possible that a split in the vein has occurred here and that the vein will resume its usual course when the tunnel is continued. A grab sample from a pile of ore on the dump assayed: Gold, 1.48 oz. to the ton.

No. 2 tunnel, at an elevation of 6,316 feet, is about 66 feet long. This tunnel starts as a crosscut and encounters the vein a short distance from the face, where it consists of several feet of ledge-matter, with a 9-inch pay-streak of oxidized quartz on the south side. A sample across this 9-inch pay-streak assayed: Gold, 3.28 oz. to the ton; silver, 1 oz. to the ton.

No. 3 tunnel, at an elevation of 6,158 feet, strikes the vein at a distance of 98 feet from the portal and the tunnel lies to the south of the vein for this distance. The tunnel then follows the vein 40 feet to the face. A short crosscut 60 feet back from the face of the tunnel strikes the vein in the face, so that the vein is developed for a total length of 60 feet. Samples taken along the vein assayed as follows:—

| Description. | Gold. | Silver. |
|---|---|---|
| | Oz. to Ton. | Oz. to Ton. |
| Across 25 inches in face | 1.46 | 0.6 |
| Across 25 inches, 10 feet back from face | 2.11 | 1.1 |
| Across 31 inches, 20 feet back from face | 1.00 | 0.4 |
| Across 32 inches, 30 feet back from face | 3.62 | 2.0 |
| Across 45 inches, 40 feet back from face | 0.98 | 1.4 |
| Across 20 inches (full width of vein not exposed) in short crosscut, 60 feet from face | 1.83 | 0.6 |

These samples give an average of $35.55 gold to the ton and 1 oz. silver to the ton for a length of 60 feet of vein over an average width of 30 inches.

Near the portal of the No. 3 tunnel there are two piles of ore which together amount to possibly 60 tons. Two samples were taken from these ore-piles, the first of which, consisting of oxidized ore representing possibly one-third of the total tonnage, or 20 tons, assayed: Gold, 4.61 oz. to the ton; silver, 2 oz. to the ton. The second sample, consisting of unoxidized quartz and apparent waste, assayed: Gold, 0.48 oz. to the ton; silver, 0.5 oz. to the ton. Assuming that the first sample represents 20 tons and the second 40 tons, the average assay of the 60 tons would be: Gold, $37.13 a ton; silver, 1 oz. a ton, which result is close to the average of $35.55 in gold to the ton and 1 oz. silver to the ton obtained from the 60-foot length of vein in the tunnel.

The No. 4 tunnel, about 408 feet long, has been driven at an altitude of 6,000 feet. For the first 270 feet the tunnel is in broken ground, in which detached masses of ore were found. The tunnel then turns northerly and encounters the vein about 63 feet back from the face, where it is 12 inches wide. The vein then is left a short distance and reappears in a short crosscut 36 feet back from the face, where it is 34 inches wide. Beyond the crosscut the vein gradually narrows down and feathers out against a fault 8 feet back from the face.

The fault strikes N. 40° E. and dips 75° to the south-east. The displacement is probably small and the vein should be picked up in a few rounds by crosscutting to the north. No work has been done below the No. 4 tunnel, where the ground falls steeply for several hundred feet. Parallel to and on each side of the *Reno* vein are the No. 3 and No. 2 veins, on which some

stripping has been done. The No. 3 vein is some 70 feet away on the north side and the No. 2 vein is about 80 feet away on the south side. The Crescent vein, paralleling the *Reno* vein some 400 feet to the south, has been stripped and trenched at intervals for a length of about 1,100 feet along the outcrop. All these veins have a similar strike and dip to the *Reno* vein and cut the same formation, the mineralization and vein-filling being much the same. The *Donnybrook* vein is some 1,700 feet to the north on the ridge separating the Fawn and Hidden Creek slopes. The vein-outcrop is developed by a 50-foot tunnel and surface-stripping for an estimated length of 500 feet. This vein, averaging 3 feet in width, is strong and well defined. Its strike is N. 80° E., parallel to the *Reno* vein, and dip 80° to the south. There is less oxidation than in the *Reno* vein and the values are not so high. The little work done on these veins so far indicates possibilities for the development of considerable tonnage of milling-grade ore.

Farther north and on the Hidden Creek slope are the Clarence and Lake veins, which were not visited for lack of time. These veins, on which some stripping has been done, are reported to have the same characteristics as the *Donnybrook* vein.

The writer did not attempt to make a thorough sampling of the *Reno* or other veins owing to the limited time at his disposal. In the case of the *Reno* vein, judging from the appearance of free gold in many places, a very considerable shoot of pay-ore is indicated above the No. 3 tunnel. This ore-shoot should be developed on the No. 4 level when the vein is picked up beyond the fault.

In conclusion, it may be said that the property has very promising surface showings and that the result of the small amount of shallow underground work, especially in the No. 3 tunnel, is very encouraging. The oxidized zone of enrichment will probably continue to considerable depth and the preliminary exploitation of this zone should be very profitable.

The property is fortunately situated in regard to transportation facilities. The veins on the Fawn Creek slope can be developed by drift-tunnels from the surface through a vertical range of approximately 1,000 feet and the slope of the hillside allows good "backs" being obtained to every foot of advance. Ample water for domestic purposes is available and timber for mining purposes is convenient and plentiful. Wash-water for milling is available on Fawn creek directly below the workings.

It would be premature to discuss power problems at this stage as everything depends on development results. If large operations eventuated, water-power could probably be developed economically on Hidden creek, where a mill-site could be connected with the property by aerial tram. A possible alternative would be the co-operation of operators in the Sheep Creek camp with a view to securing electrical energy. Towards the end of 1927 negotiations were under way for financing further development.

**Kootenay Belle.*** This property has been operated by F. M. Black and associates, of Vancouver, since about the middle of May. The *Kootenay Belle* is described in the Annual Report for 1915, since when no important activity is recorded. In the Report mentioned the property is credited with a total production up to that time of 5,137 tons of a total value of $104,966. The only production recorded since then was in 1923, when 23 tons of high-grade ore was shipped. Work by the present operators has been concentrated on the small rich vein from which four car-loads of high-grade ore have been shipped this year.

A 325-cubic-foot Ingersoll-Rand compressor driven by a 50-horse-power Robey fuel-oil engine has been installed. Camp buildings were erected and a surface tram built to connect with the Sheep Creek wagon-road. The property was temporarily shut down towards the end of the year.

**Queen.*** During the summer and fall some work was done by Allen Lavigne and associates, of Spokane, on the *Alexandra* vein on Wolf creek. The *Alexandra* is referred to in the Annual Report for 1915, which includes a description of the more extensively developed *Queen* vein, together with a synopsis of the history and production of the Queen Mines. The only appreciable production since recorded for the *Queen* was in 1916. During the last few years occasional abortive attempts have been made to resume operations, the shaft-workings having been unwatered several times. They were later allowed to fill up owing, it is reported, to lack of capital.

The present operators decided to work the smaller *Alexandra* vein, from which a small tonnage of ore was hauled by truck and put through the *Queen* stamp-mill. New work done includes the construction of a short section of road up to an ore-bin connected with the No. 2 (*Alexandra*) tunnel by short surface tram.

**Mona.*** This group, comprising some four claims owned by W. H. Miller, of Salmo, is situated on the mountain ridge forming the angle between Lost creek and the South fork of the Salmon river. In shallow cuts on the ridge ore is exposed consisting of zinc-blende, accompanied by small amounts of galena, occurring in bands as replacement deposits in the Pend d'Oreille limestone. Two open-cuts had been made by the owner, the lower one exposing a width of 16 feet of mineralization, an average sample of which gave: Silver, 1 oz. to the ton; zinc, 11.3 per cent.; lead, 0.3 per cent.

Since the writer's visit to the property in May another claim was staked on the Lost Creek slope, on which it is reported ore containing more galena was exposed in old workings. Later in the year the property was bonded by the Consolidated Mining and Smelting Company, which is reported to have had a small crew engaged in surface exploration.

ERIE CREEK (NORTH FORK OF THE SALMON RIVER).

**Arlington.*** During the fall work was resumed at the *Arlington*, about 3 miles from Erie, which had been shut down since 1913. A. D. Westby succeeded in interesting Chicago capital in the property, and with a view to exploiting the dumps of low-grade material which accumulated during former operations machinery has been taken in for a 15-stamp mill to be operated by a 50-horse-power Clayton-Shuttleworth fuel-oil engine. The mill, to which it is proposed to add flotation machinery later, is expected to be completed shortly.

According to past Annual Reports of the Minister of Mines, incomplete figures indicate a total production of around 10,000 tons of sorted ore of an average gross value of between $50 and $60 a ton. This production was made between the years 1903 and 1913, during which period the mine was operated continuously, chiefly by an English company called the Hastings (B.C.) Exploration Company, Limited. The ore consists of galena, iron pyrites, and zinc-blende in a quartz gangue, the chief values being in gold and silver.

According to the Annual Report of the Minister of Mines for 1904, the ore-deposit is a flat blanket lead of quartz, averaging 25 inches in width, occurring in a country-rock of soft, black, graphitic slates, the quartz being accompanied by a light-coloured acidic dyke, inclined to be porphyritic in structure, both of which follow together the bedding-planes of these slates and are subject to all the flexures and bending of this class of formation. In addition to the construction-work, a small amount of work is reported to have been done in the mine.

Judging from the rather sudden installation of a mill on the property, the management is apparently satisfied with the values in the old dumps and the feasibility of making a satisfactory recovery, which, according to reports, presents difficulties on account of the graphitic nature of the gangue.

*Arnold and St. Louis.**—Near Green City, which is about 6 miles from Erie, the Consolidated Mining and Smelting Company had two diamond-drills working all summer on the *Arnold*, owned by W. Connolly, and on the *St. Louis*, reported to be owned by Mrs. McAvoy and C. Green.

The mineralization in this section is mostly iron and copper sulphides occurring in rocks of the Rossland volcanic series. The drilling outfits were taken out for the winter.

**Second Relief.*** This property, consisting of the *Second Relief*, *Grand Union*, *Relief Fraction*, *Big Bump* (surface only), and *Ida D.* (one-half interest), is situated on Erie creek, 13 miles by road from Erie. The mine, which was intermittently worked between the years 1900 and 1918, has been shut down since the mill and camp buildings were destroyed by a forest fire in 1919. Owing to lack of capital no action was taken by this company since the fire and during 1927 the property was acquired under lease and bond by the Oscarson Mining Company, of Erie.

The property is being operated by three brothers, R. O., W. L., and P. E. Oscarson, and C. H. Carmichael, the two last mentioned having been formerly on the engineering staff of the Calumet and Arizona Mining Company. Twenty men are employed.

At the time of the writer's visit in October, 1927, a new mill was being built, substantial camp buildings had been erected, and a new flume 8,600 feet in length had just been completed. Subsequently a short surface tram connecting the lower tunnel with the mill was built. The mine-workings are situated on the sloping side-hill rising up from the creek and the mill and camp buildings are near the creek-level, at an elevation of about 3,950 feet.

As the mine was described in some detail by J. D. Galloway in the Annual Report of the Minister of Mines for 1915, and the amount of mining done since then has not been very large, a new description of the property will be postponed until more work has been done by the present operators, whose efforts so far have been very largely devoted to construction of plant and buildings.

Between the time of Galloway's report in 1915 and the fire in 1919 the chief work done was the advancing of No. 4 tunnel to within about 140 feet of the *Ida D.*, in which the vendors own a half-interest only. A small amount of stoping was done and a raise put up from the No. 4 tunnel to the No. 3 tunnel.

There are several quartz veins on the property, but only one has been developed to any extent. These veins have a general north-easterly strike and stand nearly vertical. They are clean-cut fissure-veins occurring in basic, igneous rocks, which, according to the West Kootenay Sheet of the Geological Survey of Canada, are probably members of the Rossland volcanic series. This formation contacts with granitic rocks of the Nelson batholith a short distance up the creek.

The ore consists of quartz and altered wall-rock mineralized with pyrite, pyrrhotite, a little chalcopyrite, and possibly occasional arsenopyrite. The values are almost entirely in gold, the silver content being almost negligible.

The main vein, which is nearest the creek, is developed by three adit-tunnels and a blind intermediate level between the two upper tunnels, numbered successively from 1 to 4. These workings develop the vein for a length of about 1,200 feet through a vertical range of over 400 feet. Below No. 4 level a long crosscut will be required to give an additional depth of 100 feet and below this it will be necessary to sink.

The vein in No. 4 tunnel, from 6 inches to 7 feet in width and possibly averaging around 2 feet, shows practically continuous mineralization in varying degree throughout the drift. The values are irregular, but nearly all the vein carries gold in some proportion.

From No. 2 level to the surface the ore has been pretty well stoped out. Between No. 4 and No. 2 levels from one-half to two-thirds of the area has been stoped, but there is a considerable amount of ore left which, with a mill making a high recovery, could be mined at a profit.

Between the face of No. 4 and the *Ida D.* line a good block of ground, hitherto untouched, is expected, as some of the best values in the mine were encountered on the level above and good assays have been obtained at the end of No. 4.

In addition to ore immediately available for stoping in the mine, estimated by the management at not less than 5,000 tons, there is a considerable quantity of tailings in the creek-bed below the mill, estimated at several thousand tons of recoverable material which remains from the tailings accumulated during former operations and which it is considered possible to re-treat owing to the low recovery previously made. The other veins on the property, one of which shows good values on the surface, will also be explored.

The first mill installed in 1902 is reported to have consisted of a small crusher, two 5-stamp batteries, and two Wilfley tables, crushing to 40-mesh and having a daily capacity of 25 tons. This machinery was driven by water-power, under a head of 178 feet, utilizing three Pelton wheels. Subsequently the Relief Gold Mining Company put in additional equipment, including a tube-mill to recrush the oversize "middling" from the tables and a cyanide agitation plant to treat this product, the milling capacity at this time being raised to 50 tons daily. No information is available as to the recovery made, but apparently it still left room for improvement.

The present operators have had extensive tests made on the ore with a view to treatment by improved practices, and as a result have installed the following equipment and experimental flow-sheet: 8 by 12 Blake crusher; ball-mill, converted from the old 4- by 20-foot tube-mill, driven by a Pelton wheel; classifier to 200-mesh, the oversize being returned; and five 15- by 1½-foot sections of Morgan Mat-O-Gold rubber on inclined tables, the concentrates from which are to be amalgamated and retorted. A recovery from 80 to 90 per cent. is looked for; should this not be obtained flotation will be introduced to bring the recovery to the required figure. Successful laboratory tests were made which the management expects to improve upon in practice.

Two other Pelton wheels are in use, running one-half of the old Rand 10-drill compressor and electric-lighting plant respectively. New equipment includes two Pelton wheels, Sullivan drill-sharpener, and classifier. The tube-mill, Blake crusher, compressor, and small Pelton wheel remain from previous operations.

At the end of 1927 the crew was temporarily reduced owing to transportation difficulties caused by the heavy snowfall, but it is anticipated that the mine and mill will be in active operation by spring.

### Pend d'Oreille River Section.

The geology of this area is shown on Map 80A accompanying Geological Survey of Canada Memoir No. 38, "Geology of the Forty-ninth Parallel," by R. A. Daly.

**International and Drumlummon.*** These properties are owned by R. M. Reeves and J. H. McDonald. During the year exploration of the lead-zinc replacement deposits of the Pend d'Oreille limestone-belt was continued by the Victoria Syndicate with a crew averaging about twenty men. In addition to a considerable amount of preliminary diamond-drilling, the exploratory work done since operations were started in 1925 includes underground development amounting to more than 2,500 feet on the Reeves property, where compressor equipment was used, and 1,500 feet driven by hand on the McDonald property.

The properties are situated in the triangular area between the Pend d'Oreille and Salmo rivers and are accessible by a branch road connecting with the Nelson–Spokane highway near the International boundary. The portal of the McDonald tunnel is about 60 feet above the level of the Pend d'Oreille river and the Reeves workings are located some 4,000 feet to the north-east.

**Red Bird.*** On the opposite side of the river, and in the continuation of the mineralized belt being explored by the Victoria Syndicate, a small amount of work was done by the Red Bird Mining Company, of Spokane. The property consists of seventeen mineral claims containing an area of about 800 acres. The large surface showings of oxidized and leached material, carrying values in silver, lead, and zinc, indicated encouraging possibilities and the property was acquired by the present company in 1924 from A. Campbell and S. Coulter.

The results of subsequent underground work, amounting to over 1,000 feet of tunnelling in the aggregate, have been somewhat indefinite. Faulting was encountered and latterly surface prospecting was again resorted to.

### Near Nelson.

**Silver Reef.*** The *Silver Reef* group consists of the *Rover*, *Silver Reef*, and *Leroy*, situated in the angle between the forks of Anderson creek just east of the Fairview district of the city of Nelson. The property is owned by W. Richards, W. Symons, and R. Barron. A small amount of development was done by the Silver Leaf Mines, Limited, which is the name of the company promoted by H. E. Morgan to acquire and operate the property under lease and bond. Some payments have been made to the owners.

The main tunnel on the *Rover* vein, at an elevation of about 3,150 feet above sea-level, or roughly 1,400 feet higher than Kootenay lake, is situated on the North fork of Anderson creek, about half a mile from the Great Northern Railway tracks.

The formation of the area is composed of granitic rocks of the Nelson batholith. The deposits occur in two veins occupying fissures in granodiorite. Basic lamprophyre dykes follow the veins closely along the lines of fissuring, which strike north-westerly and dip steeply to the north-east.

The workings on the *Rover* vein, on which most of the development has been done, are south of the creek. In the aggregate these workings amount to about 700 feet of work. Four tunnels, three of which are short, develop the vein throughout a vertical range of about 150 feet and for a length of some 350 feet. Another short tunnel much higher up on the steep mountain-side (not visited by the writer) and open-cuts are understood to trace the continuity of the vein a considerable distance.

The principal working on the *Rover* lead is a drift-tunnel following the vein for about 350 feet in length. On this level raises were put up in ore and a small amount of stoping done at points roughly 100 and 250 feet in from the portal. The raise first encountered from the portal, or No. 1 raise south, connects with the tunnel above and is in ore throughout.

In the stopes off these raises the vein, including quartz and gouge, is up to 5 feet wide. The ore consists of alternate bands of galena, zinc-blende, and pyrite, with some chalcopyrite, in a gangue composed of quartz, with some accessory calcite and siderite. Lead carbonates occur in oxidized ledge-matter in the upper part of No. 1 raise south.

Towards the face of the main tunnel the vein is split by a lamprophyre dyke and the tunnel branches into two portions, each following quartz. Before extending this level to the south it would be advisable to trench on the surface vertically above the disturbance of the vein by the dyke.

The following samples were taken of ore from the *Rover* vein:—

| Description. | Gold. | Silver. | Lead. | Zinc. |
|---|---|---|---|---|
| | Oz. to Ton. | Oz. to Ton. | Per Cent. | Per Cent. |
| Sacked carbonates from No. 1 raise south | 0.06 | 9.1 | 30.9 | 6.6 |
| Sorted lead ore in sacks | 0.04 | 22.2 | 54.8 | 7.2 |
| Sorted zinc ore in sacks | 0.12 | 5.1 | 19.2 | 33.1 |

The *Silver Reef* vein workings are on the northern side of the creek. At an elevation of about 3,300 feet above sea-level, or about 200 feet above the creek, there is a crosscut tunnel from which a short drift extends north-westerly along the foot-wall side of a wide sheared and silicified zone in the granite. This zone, of an estimated width of 40 feet, strikes N. 45° W. and dips about 57° to the north-east. Bands of quartz are developed on both walls of the zone and in its central portion there is a wide lamprophyre dyke of a dark-green colour, in which are inclusions of country-rock and quartz.

In the short drift recent work has exposed a width of 5 feet of mineralization consisting chiefly of a fine-grained mixture of lead, zinc, and iron sulphides in a gangue of altered country-rock. A sample representing a width of 5 feet assayed: Silver, 1.9 oz. to the ton; lead, 10.4 per cent.; zinc, 8.6 per cent. This sample also contained 0.21 per cent. nickel. A little below the drift a crosscut tunnel has been started to develop the showing.

In conclusion, it may be said that while small shipments of sorted ore can be made, the future of the property would seem to depend on the development of sufficient tonnage of milling-ore to warrant installation of ore-dressing plant and cheap handling facilities. The *Rover* vein ore is amenable to sorting, while the ore of the *Silver Reef* vein would require concentration.

The *Silver Reef* is very favourably situated in regard to transportation and power-supply. Good water for camp purposes and timber for mining are available in the immediate vicinity of the workings.

A small shipment was made to the Trail smelter for a mill test. Towards the end of the year work was temporarily discontinued by H. E. Morgan, who expects to resume development shortly.

**Gold Hill.***

The *Gold Hill* property consists of the *Gold Hill*, *Silver Crown*, and *Copper Chief*, owned by Alex. McDonald, most of the work having been done on the *Gold Hill*. The following summary report was made under the provisions in aid to prospectors, subsections (*a*), (*b*), and (*e*) of section 10 of the "Mineral Survey and Development Act":—

The property is situated on the eastern side of 49 creek near its headwaters, the elevation of the tunnel being 4,960 feet above sea-level. The mine is connected by road with Granite, on the Canadian Pacific Railway, some 8½ miles distant.

The formation of the surrounding area is composed of schists of the Rossland volcanic group, the rocks consisting of interbanded porphyries and porphyrites and their metamorphosed schistose equivalents. The whole series has a north-westerly to south-westerly strike and dip from steeply to the north-east to nearly vertical. In general the veins coincide in strike and dip with the schists forming the country-rock.

Three distinct veins are indicated by the underground workings, which in the aggregate amount to over 2,000 lineal feet. Only a very small amount of stoping has been done. The surface workings consist of some trenches made by ground-sluicing, some open-cuts, and a short tunnel.

The veins, up to 2 feet in width where they have been worked, follow well-defined lines of cleavage. The gangue is quartz and the mineralization consists of pyrite, arsenopyrite, chalcopyrite, bornite, and occasional chrysocolla. In the oxidized portions of the veins malachite,

azurite, and occasional free gold are found. The principal values are in gold with a little silver and copper.

The principal working consists of a crosscut tunnel some 560 feet in length, from the end of which tunnels branch out in various directions. Most of the tunnelling has been along dykes, fault-fissures, and slip-planes.

The first (or No. 1) vein encountered is just inside the portal of the long crosscut, where it was drifted on 23 feet north-westerly. This vein, from 1 to 2 feet wide, is also exposed in some open-cuts and a short tunnel on the surface on both sides of the portal of the long crosscut. This vein is slightly mineralized in places and a sample across 12 inches from the open-cut about 80 feet south-easterly from the portal of the main tunnel assayed: Gold, 0.31 oz. to the ton; silver, 1.6 oz. to the ton; copper, 0.32 per cent. In the year 1903 about 5 tons of ore was shipped to the Hall Mines smelter from the surface above this vein, which assayed: Gold, 1.26 oz. to the ton; silver, 1.6 oz. to the ton. This ore, which is said to have been loose, was the reason for driving the long crosscut. It seems to the writer, however, that this ore must have been connected with No. 1 vein.

In the crosscut tunnel about 60 feet in from the portal a tunnel has been driven 18 feet north-westerly along a lamprophyre dyke. No. 2 vein was encountered about 560 feet from the portal of the main crosscut at a vertical depth of about 300 feet below the surface and was drifted on a short distance north-westerly to where it is cut off by a lamprophyre dyke at the northern end of the "Gormley stope." Below this stope there is a winze from which about 3 tons of ore was shipped to the Hall Mines smelter in 1903, the assay for which was: Gold, 4.12 oz. to the ton; silver, 2.3 oz. to the ton. From the same winze in July, 1922, some leasers shipped about 9¼ tons to the Trail smelter, which assayed: Gold, 1.99 oz. to the ton; silver, 1.5 oz. to the ton; copper, 1.4 per cent. From above the level G. Gormley shipped ore in 1921 and January, 1922, extracts from the smelter returns for this ore being as follows:—

February, 1921, gross weight, 66,800 lb.: Gold, 2.735 oz. to the ton; silver, 1.6 oz. to the ton; copper, 1.18 per cent. October, 1921, gross weight, 53.8 tons, containing: Gold 127.671 oz. to the ton; silver, 83.68 oz. to the ton; copper, 1,017 lb. January, 1922, gross weight, 40,770 lb.: Gold, 1.46 oz. to the ton; silver, 3.5 oz. to the ton; copper, 2.78 per cent.

This stope (Gormley's) was not examined by the writer owing to its unsafe condition. A block of faulted ground containing broken sections of vein separates the stoped portion of the vein from the "south drift," which is driven south-easterly some 120 feet on the same vein. In this south drift the vein follows a well-defined line of cleavage and contains elongated lenses of brecciated quartz mineralized in places with copper carbonates and specks of bornite. A sample across 6 inches, about 10 feet back from the face, assayed: Gold, 0.38 oz. to the ton; silver, 1.1 oz. to the ton; copper, 0.95 per cent.

No. 3 vein is encountered in the northerly extension of the main crosscut about 80 feet beyond the north end of Gormley's stope, no work having been done at its intersection. What is apparently the same vein shows in the north-westerly drift, where G. McLaren did a small amount of stoping in 1925, when he shipped some 12½ tons to the Trail smelter, which returned: Gold, 1.38 oz. to the ton; silver, 1.1 oz. to the ton; copper, 0.66 per cent. A short distance south-easterly from McLaren's stope the vein goes into the northern wall of the tunnel. A sample across the vein, 5 inches wide, where it leaves the tunnel assayed: Gold, 0.04 oz. to the ton; silver, 2.4 oz. to the ton; copper, 0.45 per cent. In addition to the three veins mentioned, short sections of other quartz veins show in places in the workings, but these do not appear to have any continuity.

It will be noted that only a small amount of work has been done on the veins and that by far the greater part of the work has been done along dykes, fault-fissures, and slip-planes. While a great deal of this work was unnecessary, there is afforded thereby a considerable amount of information which will be of value in planning future work. The greatest length of vein drifted on is about 160 feet (No. 2 vein) and only a short length at the northern end of it was stoped by Gormley to where it was cut off by a dyke. A tunnel was driven north-westerly along this dyke, but no crosscutting was done such as would be necessary to pick up the faulted extension of the vein.

Only a very little work has been done on the Nos. 1 and 3 veins. Therefore the situation at the present time is that there are possibilities of finding small shoots of high-grade ore with a small amount of work.

**True Fissure.*** This mineral claim, situated on Connor creek (the West fork of Rover creek), south-west of Nelson, was bonded early in the year by J. Birtsch to J. Desordi and associates, who did a small amount of work and shipped a car-load of sorted ore. The workings are reached by a trail about 4 miles long from the end of the old Rover Creek wagon-road.

An old caved drift some 55 feet in length develops a small fissure-vein cutting schists of the Rossland volcanic series. The vein, standing nearly vertical, strikes up the steep mountain-side. Between the drift and the surface the ground has been stoped out.

On the surface above the workings there was, when examined, an almost continuous streak of ore for a length of about 100 feet. This ore is clean, consisting of galena, zinc-blende, and iron oxide. A sample across 2 inches on the surface above the stoped ground assayed: Gold, 0.12 oz. to the ton; silver, 203.7 oz. to the ton; lead, 15.3 per cent.; zinc, 32 per cent. About 20 feet inside the caved drift a shallow winze is reported to have been sunk which was supposed to contain 8 inches of good ore, and the lessees proposed to clean out the workings to verify this before doing further work.

**Fern.*** A small amount of work has been done at intervals on the *Fern* since 1924, when it was leased by O. O. Groh and associates, of Spokane. The *Fern* is situated on the steep southern slope of Hall creek, about 5,000 feet above sea-level. A road about 3 miles long connects the old mill-site with Hall Siding on the Great Northern Railway south of Nelson. The mill, long disused, was dismantled some years ago. A detailed description of the property, including its history and past production, is contained in Geological Survey of Canada, Memoir 94, "Ymir Mining Camp" (1917).

The old workings develop a quartz-filled fissure-vein cutting rocks of the Rossland volcanic series. The vein, from a few inches up to 8 feet in width, strikes north-east by east, with an average dip of 60° to the north-west. The vein-filling and gangue is quartz containing pyrite and free gold. Throughout the productive stretches the vein follows a granite-porphyry dyke which dips and strikes with it and forms one or the other wall.

Incomplete figures indicate the value of past production as having been at least $200,000, mostly derived from ore milled, but including small amounts of concentrates and high-grade sorted ore. The bulk of this production was made between 1897 and 1902.

Subsequently the mine was closed down owing to the vein having been cut off at the south-western end of the workings by a lamprophyre dyke, beyond which it has not yet been located. Since then the mine has been leased several times. Small shipments have been made from the old workings and a small amount of prospecting has been done for the lateral extension of the vein beyond the fault-plane.

The known ore-bodies in the old workings are pretty well stoped out, but a small amount of work done by Groh indicates that there may be small areas of good milling-ore left between No. 3 and No. 4 levels which would only be of value, however, if additional tonnage could be developed on the property justifying the installation of a small mill. Other work done under the present lease includes some 80 feet of development-work on No. 3 level beyond the lamprophyre-dyke fault-plane and the driving of a new tunnel 165 feet in length to develop a parallel quartz-filled fissure known as the "Dead Man vein," which outcrops about 50 or 60 yards easterly from the portal of No. 3 *Fern* tunnel. A small compressor and gas-engine were installed to drive the Dead Man tunnel.

In regard to future work on the *Fern* vein, the territory south-west of the fault deserves further exploration with a view to finding the continuation of the vein. The work done by Groh beyond the lamprophyre dyke on No. 3 level is interesting in that a granite-porphyry dyke was struck at about 90 feet from the fault. If this dyke is the same as the one which lies on the foot-wall side of the vein about 30 feet north-east of the fault, which is probable, a horizontal displacement or heave along the fault in a south-easterly direction is indicated and a small amount of work might pick up the vein.

In the Dead Man tunnel the vein is from a mere seam to 12 inches in width. Gold values are obtainable where the vein is oxidized and decomposed, but the tunnel does not yet show ore in any appreciable quantity. Some open-cuts farther up the hill, believed to be on the continuation of the Dead Man vein, were not visited owing to lack of time.

**Euphrates.*** The discoveries made by the Terzian Bros. on the eastern side of the Salmo river, about 9 miles south of Nelson, were described in the Annual Report for 1926. More ground has been staked, so that the property now consists of some sixteen claims owned by S. Terzian, E. Terzian, A. Pashgian, and G. Pashgian. A small amount of work has been done on a new quartz-filled fissure-vein discovered this year on the *L.T.* claim. This vein also coincides in strike with the enclosing schists of the Rossland volcanic series, which is from S. 40° E. to S. 45° E. up the hill, but dips steeply to the north-east, cutting across the schistosity of the rocks. As exposed in shallow surface cuts this vein, which is well defined between smooth walls, varies in width from a few inches up to 2 feet, and contains pockets of oxidized decomposed material carrying high values in free gold. In places where there is less oxidation in evidence the mineralization consists of small amounts of disseminated galena, zinc-blende, and pyrite in the quartz gangue.

Samples across 3 and 4 inches of decomposed vein-matter assayed respectively: Gold, 16.52 oz. to the ton; silver, 7.2 oz. to the ton; and: Gold, 19.12 oz. to the ton; silver, 9 oz. to the ton. A grab sample from seventy sacks of this ore assayed: Gold, 11.84 oz. to the ton; silver, 6.5 oz. to the ton. Seven tons of similar material are reported to have been put through the *Golden Age* 20-stamp mill across the river, from which gold bullion to the approximate value of $1,500 was recovered.

Farther up the mountain the old *Lost Cabin*, consisting of the *Queen Mary* and *Lost Cabin*, was acquired and included in the *Euphrates*. The old underground workings on the *Lost Cabin*, consisting of some short tunnels and two shafts, were all caved and inaccessible when visited by the writer. Open-cuts indicate elongated lenses of quartz coinciding in strike and dip with the enclosing schistose rocks of the Rossland volcanic group, the mineralization consisting chiefly of disseminated pyrite, with occasional spots of galena and zinc-blende.

Samples taken in open-cuts across 3 feet and 7½ feet, respectively, assayed: Gold, 0.28 oz. to the ton; silver, 0.4 oz. to the ton; lead, 0.6 per cent.; zinc, 0.9 per cent.; and: Gold, 0.26 oz. to the ton; silver, 0.4 oz. to the ton; lead, 1 per cent.; zinc, 1.1 per cent.

Work done this year includes the construction of a water-power supply line, 7,000 feet in length, from Clearwater creek to operate a small compressor which has recently been installed, under a head of 300 feet, the water being utilized through a 5-foot Impulse wheel designed and built by the Nelson Iron Works.

The owners of the property propose to incorporate a company to develop the property.

**Alpine.*** The *Alpine* group consists of the following Crown-granted claims: *Kootenay Pass*, Lot 2882; *Berne*, Lot 2881; *Swiss*, Lot 2879, all owned by E. Harrop *et al.* The property is situated at the head of Sitkum creek, which flows into the West arm of Kootenay lake, on the eastern slope of the Lemon Creek divide. A trail 9 or 10 miles in length connects the property with the wagon-road near Bourke's ranch at Crescent bay. The elevation of the old cabin, below the workings, is 6,750 feet according to a survey of the claims. The formation is composed of granitic rocks of the Nelson batholith. Basic lamprophyre dykes striking north-westerly cut the granite in places.

Some open-cuts and two tunnels trace the outcrop of a quartz-filled fissure-vein for several thousand feet. The average width of the vein is about 4½ feet. The ore-minerals consist of auriferous pyrite associated in places with small amounts of galena and zinc-blende. Visible free gold is found in the oxidized portion of the vein, which is considerably decomposed and stained with iron oxide in places. The vein strikes westerly, climbing diagonally up the steep mountain-side, and dips flatly to the north or into the hill.

The principal working is a tunnel 189 feet in length at an altitude of about 7,150 feet. This tunnel is driven westerly along the strike of the vein. Samples taken at 10-foot intervals for the first 50 feet show an average of $14.20 gold a ton over an average width of 54 inches. At about 60 feet in from the portal of the tunnel a mica-lamprophyre dyke 12 feet wide cuts north-westerly across the vein. Beyond the dyke the vein is picked up again without apparent displacement and followed for a length of about 28 feet to where it is cut and faulted on another basic lamprophyre dyke also striking north-westerly. The dip of this dyke is about 77° to the south-west. Between the two dykes samples of the vein showed average values of $8.40 across an average width of 69 inches.

Beyond the fault the vein is not exposed in the tunnel, which continues along the general direction of the strike of the vein for a short distance and then turns south for some 40 feet.

On the surface the vein is exposed in a short tunnel and open-cuts for several hundred feet on each side of the 189-foot tunnel, the width of the vein varying from 3½ to 5 feet. A sample taken across 42 inches in an open-cut 150 feet westerly from the portal of the main tunnel assayed $10.20 gold a ton.

The highest point on the outcrop of the vein is an open-cut at about 7,300 feet on the *Kootenay Pass*. At the easterly end of the outcrop there are two open-cuts on the *Swiss*, a short distance north-easterly from the cabin and at about 6,800 feet altitude. The cabin is situated on gently sloping ground. The vein can therefore be developed for a length of between 4,000 and 5,000 feet and through a vertical range of 500 feet by drift-tunnels.

In conclusion, it may be said that the small amount of superficial work done so far indicates that the vein is strong and well defined and contains ore-shoots in places showing good milling values over a workable width.

The above report was made in accordance with the provisions in aid to prospectors under subsections (*a*), (*b*), and (*e*) of section 10 of the "Mineral Survey and Development Act."

## Kootenay Lake.

**Associated Mining and Milling Co., Ltd.***

A brief report on the Associated Company's holdings is contained in the Annual Report for 1926, but since then the property has again been visited in order to examine the workings, which had been cleaned out and made accessible since the writer's first inspection. The company, with registered offices in Trail, was incorporated during 1926 to acquire and operate mining properties near Ginol Landing on the east side of Kootenay lake. W. Frampton is president and field manager and the directorate includes business and professional men of Trail. The Associated Mining and Milling Company, Limited, is understood to control the United Lode Mining Company, Limited, also of Trail, which has acquired some old claims on Akokli (Goat) creek between Ginol and Boswell. The property of the United Lode Mining Company is described separately at the end of this report.

A considerable amount of exploratory work, scattered over a large area, was done between 1895 and 1902 by individuals and companies who subsequently abandoned the camp. Some twenty-six or twenty-seven years ago the Valparaiso Gold Mines, Limited, and the Imperial Mines, Limited, were operating the *Valparaiso* and *Maratt* properties respectively. The old *Maratt* group is now known as the *Sarah 2nd*. These two properties constitute the nucleus of the present property of the Associated Mining and Milling Company.

So far as the official records are concerned, the Associated Company holds, at the time of writing, three Crown-granted and twenty-one other mineral claims, but, in addition, about sixty claims have been located in the vicinity of Ginol Landing during the last two years by officials, employees, and others connected with the company.

Reverted Crown-granted mineral claims which have been acquired are: *Valparaiso*, Lot 4907; *Government*, Lot 4908; *Martilda*, Lot 3870; *Schmilka*, Lot 3871; *Starter*, Lot 4912; *No. 3*, Lot 4911; *Kootenay*, Lot 3798; *Vancouver*, Lot 3797. The first three are registered in the name of the Associated Mining and Milling Company and the last five in the name of W. Frampton.

In view of the large number of above-mentioned new claims located around and among the claims of the Associated and United Lode Mining Companies, and in view of the absence of any reliable survey plans, the boundaries of these companies' properties are somewhat obscure. Therefore the following report may not be confined entirely to the companies' present holdings and may inadvertently include showings on claims held by other parties. The area involved is large, but as far as is known the showings hereinafter described form the principal development.

The writer examined the principal veins and showings, which are briefly as follows:—

### *Valparaiso Lode.*

The *Valparaiso-Government* vein is a well-defined quartz-filled fissure striking northerly along the contour of the mountain-side and from 1,900 to 2,400 feet above the level of Kootenay lake. The vein dips easterly, or into the hill, at about 40°. The country-rocks consist of granitic rocks of the Nelson batholith. On the surface the quartz is mineralized in places with pyrite, arsenopyrite, and occasional specks of galena, the values being in gold and silver. Commercial values are apparently confined to streaks and narrow bands in which the sulphides are concentrated in places.

The old workings, consisting of some short tunnels and numerous open-cuts, trace the outcrop of the vein for a length of several thousand feet. At the southern extremity of the area examined there is a short crosscut tunnel which has not been driven far enough to cut the vein. Near this tunnel there are two open-cuts in which the vein could not clearly be seen for debris. Grab samples, taken by the writer in 1926, of broken ore from small piles on the dumps of both cuts assayed: Gold, 0.58 oz. to the ton; silver, 0.6 oz. to the ton; and: Gold, 0.47 oz. to the ton; silver, 16.2 oz. to the ton. These samples did not represent any definite tonnage.

Going northerly along the outcrop and on the *Valparaiso* claim a crosscut has been driven about 230 feet, tapping the vein at a depth of about 125 feet. From the crosscut drifts extend northerly and southerly. In the north drift the vein, averaging over 6 feet in width, is all more or less stained with oxide of iron and is decomposed in places. At about 30 feet along the north drift from the crosscut a raise has been put up about 66 feet (estimated) on the hanging-wall side of the vein. Average samples taken at 10-foot intervals, wherever possible, throughout the north drift and along the accessible portions of the raise and winze gave the following results:—

| Description. | Width. | Gold. | Silver. |
|---|---|---|---|
| | Feet. | Oz. to Ton. | Oz. to Ton. |
| Intersection of crosscut and north drift | 8 | 0.18 | 2.6 |
| North drift, 10 feet from crosscut | 6 | 0.41 | 1.4 |
| North drift, 24 feet from crosscut | 6 | 0.08 | 1.0 |
| North drift, 44 feet from crosscut | 6 | Trace | 0.2 |
| North drift, 54 feet from crosscut | 6 | 0.07 | 1.6 |
| North drift, 64 feet from crosscut (full width of vein not exposed) | 4 | 0.10 | 1.3 |
| North drift, 74 feet from crosscut | 6 | 0.02 | 0.5 |
| North drift, 84 feet from crosscut (full width of vein not exposed) | 4 | 0.11 | 1.6 |
| North drift, 94 feet from crosscut | 6 | 0.03 | 1.0 |
| North drift, 104 feet from crosscut | 6 | 0.04 | 0.5 |
| North drift, 114 feet from crosscut | 6 | 0.03 | 0.6 |
| In face of north drift, 124 feet from crosscut (full width of vein not accessible) | 8 | 0.10 | 1.3 |
| Raise in north drift. Representing 3½ feet on hanging-wall side of vein for length of about 50 feet (full width of vein not exposed) | 3½ | 0.03 | 0.8 |
| North drift. Sample representing a length of about 30 feet (full width of vein not exposed) | 4 | 0.02 | 0.8 |

At the time the writer examined the property in 1926 the north drift was inaccessible for caving. One sample was then taken across 2 feet of quartz and oxidized material at the intersection of the vein in the crosscut; this sample, which apparently contained some local enrichment due to oxidation, assayed: Gold, 1.04 oz. to the ton; silver, 4.2 oz. to the ton.

The vein in the south drift is broken and evidently contains no values. In the open-cut just above the *Valparaiso* tunnel a sample across a 6-inch band of quartz heavily impregnated with iron sulphides on the foot-wall side of the vein assayed: Gold, 0.24 oz. to the ton; silver, 2.1 oz. to the ton.

Another sample across the 3½ feet adjoining the last sample on the hanging-wall side assayed: Gold, 0.06 oz. to the ton; silver, 1.4 oz. to the ton.

The only other underground working in which the *Valparaiso* vein is exposed is the "Lost Mine" tunnel, several thousand feet distant from the *Valparaiso* tunnel towards the northern extension of the vein-outcrop. This tunnel is driven about 120 feet along the vein, which is mostly inaccessible for lagging. In this tunnel a sample across 40 inches of decomposed granitic ledge-matter and quartz, all more or less stained with iron oxide, assayed: Gold, 0.02 oz. to the ton; silver, 0.8 oz. to the ton.

It was not possible to examine or sample all the open-cuts in the limited time available, but as no ore of any consequence has been developed in the underground workings on this vein it is clearly impossible to estimate any tonnage. The few samples from the surface were taken in the vicinity of the underground workings with a view to correlating values, if possible, which might indicate shoots of ore.

*Imperial Camp.*

**Sarah 2nd.*** Approximately parallel to the *Valparaiso* vein, and about 700 feet vertically above it, some old tunnels and open-cuts develop the *Sarah 2nd* vein for a length of about 400 feet. The formation here is also granite, which is cut by mica-lamprophyre dykes in the vicinity of the vein. This vein dips into the hill, the gangue consisting of quartz, rusty and honeycombed in places, mineralized irregularly with a little sparsely disseminated pyrite and galena and occasionally with copper-carbonate stains. At one point a little wolframite was noted associated with pyrite and galena.

The following samples were taken from the *Sarah 2nd* workings:—

| Description. | Gold. | Silver. |
|---|---|---|
| | Oz. to Ton. | Oz. to Ton. |
| Open-cut, grab from small pile of quartz containing a little sparsely disseminated pyrite and galena | 0.01 | 0.9 |
| Open-cut, grab from a small pile of honeycombed, rusty quartz | 0.02 | 2.7 |
| Open-cut, grab from small pile of quartz containing some pyrite | 0.04 | 1.7 |
| Upper tunnel, grab from pile of oxidized quartz outside portal | 0.02 | 1.1 |
| Caved tunnel about 300 feet southerly from upper tunnel, grab from pile of quartz outside portal; some of quartz is mineralized with disseminated pyrite, occasional galena, and wolframite | 0.03 | 0.5 |
| Same caved tunnel, small pile of selected material outside portal | Trace | 0.7* |
| Lower tunnel, selected quartz from small pile outside portal containing disseminated pyrite, occasional spots of galena and copper-stains | 0.02 | 1.1† |
| Upper tunnel, across hanging-wall, 30 inches of oxidized quartz vein and ledge-matter (vein only partially exposed) | 0.03 | 2.7 |

* Also tungstic oxide, 2.52 per cent. † Also lead, 0.6 per cent.

As the vein in the open-cuts was not accessible for debris and the tunnels were all more or less caved, the above samples (with the exception of the last one) were taken from small quantities of selected material piled up outside the workings.

**Royal.*** The *Royal* group is located southerly from the *Valparaiso-Government* workings. The workings examined on this group, consisting chiefly of open-cuts, develop several outcroppings of quartz and silicified fractures in granite at elevations ranging from 850 to 1,350 feet vertically above the lake. At about 1,350 feet above the lake an open-cut exposes a short section of oxidized vein, striking northerly with easterly dip from 2 to 2½ feet wide, an average sample of which assayed: Gold, trace; silver, 0.3 oz. to the ton; lead, 1.1 per cent.; zinc, 0.7 per cent. A short distance southerly along the outcrop and at a slightly lower elevation an old tunnel has been driven some 170 feet in the granite without developing any ore and no vein could be seen in the face.

A few hundred feet southerly and about 1,000 feet vertically above the lake there is exposed a short length of flat-lying quartz vein, well mineralized in places with galena. A sample across a width of 18 inches where the mineralization was strongest assayed: Gold, 0.02 oz. to the ton; silver, 4.1 oz. to the ton; lead, 38.9 per cent.; zinc, 0.6 per cent. A small picked sample of galena free from gangue assayed: Gold, 0.04 oz. to the ton; silver, 19.8 oz. to the ton; lead, 76.5 per cent.; zinc, 7 per cent.

A few hundred feet farther towards the south along the contour of the hill short segments of quartz veins, containing sparsely disseminated galena, are exposed in two open-cuts. A sample across 18 inches in the most southerly of these two open-cuts, about 850 feet vertically above the lake, assayed: Gold, 0.01 oz. to the ton; silver, 1.4 oz. to the ton; lead, 1.1 per cent.; zinc, 0.6 per cent.

A small amount of mining was done during 1927 on the three properties described above, about sufficient to satisfy assessment requirements. Caved workings were cleaned out, trails were opened up, and cabins repaired, all the work being of a preparatory nature.

In regard to the *Valparaiso* property and *Maratt* group (now *Sarah 2nd*), statements have been circulated to the effect that the old Valparaiso Gold Mines, Limited, and the Imperial Mines, Limited, had been profitably operated some thirty years ago under obsolete methods. In support

of these statements reference has been made to an extract from the Annual Report for the year 1900, page 855 (report of E. N. Murphy, Mining Recorder), in which it is stated that on the *Maratt* group "plenty of ore is being taken out to pay the expenses of development." The statement quoted was probably based on what the Mining Recorder was told and not from direct knowledge. In this case the Mining Recorder was evidently misinformed as there is no evidence of any profitable production having been made by the *Maratt* group (Imperial Mines, Limited). Diligent search, both at Nelson and Kaslo, of the returns made under the "Taxation Act," which came into force in 1897, failed to show this company or the Valparaiso Gold Mines, Limited, or the names of the claims operated by these companies. Moreover, no stoping was done in the underground workings and the surface cuts are all shallow.

**United Lode Mining Co., Ltd.***

In the Annual Report for 1926 brief reference was made to the *Copper Canyon* group, which had not then been visited. At that time this company's property was understood to consist of the following claims: *Copper Canyon, Copper Creek, Dark Canyon, Nakusp, Red Rock, Copper Hill*, and *Copper Centre*. In the books of the Mining Recorder at Nelson, at the time of writing, these claims are recorded in the names of the following persons, who are connected directly or indirectly with the Associated Mining and Milling Company, Limited: W. Frampton, Mary Karpowich, A. G. Harvey, J. H. Vestrup (two claims), W. C. McKenzie, and W. J. Wagstaff. In a recent communication from A. G. Harvey, vice-president of the United Lode Mining Company, Limited, a list is enclosed of the mineral claims, twenty-five in number, controlled by this company. The property is situated on the northern side of Akokli (Goat) creek, about 2½ miles by road and trail from the lake and about 2,400 feet vertically above it.

The formation on the northern side of Akokli creek consists of metamorphosed sedimentary rocks consisting of alternating bands of coloured schists, quartzites, conglomerates, and dolomites. The geology of the area has not yet been mapped in detail. On the West Kootenay Sheet, Map 792, Geological Survey of Canada, the rocks on the northern side of Akokli creek are provisionally classified as members of the Lower Selkirk series, which are tentatively referred to the Cambro-Silurian or Cambrian periods. However, this geology is understood to be undergoing revision by J. F. Walker, of the Geological Survey of Canada. The country-rocks are apparently quartzites and quartzose schists.

The lower tunnel, about 140 feet in length, follows a quartz vein from 2½ to 4 feet wide, mineralized with irregular disseminations, stringers, and bunches of pyrite and chalcopyrite and stains of the copper carbonates.

The upper tunnel, about 35 feet in length and about 40 or 50 feet above the lower tunnel, develops the same quartz vein, which is up to 4 feet wide and contains similar mineralization. Grab samples from small piles of selected material derived from these workings assayed as follows:—

| Description. | Gold. | Silver. | Copper. |
|---|---|---|---|
| | Oz. to Ton. | Oz. to Ton. | Per Cent. |
| Open-cut above upper tunnel | 0.01 | 1.0 | 3.06 |
| Upper tunnel | Trace | 0.6 | 0.91 |
| Lower tunnel | 0.02 | 1.1 | 4.21 |

The work done during the year was of a preliminary nature, including the reconditioning of the old workings, repairing cabins and trails.

**Country Girl and Iolanthe.***

A small amount of work has been done during the year on these old prospects, which were briefly described in the Annual Report for 1926. According to the official records at Nelson, the claims are recorded in the following names: *Iolanthe* and *Country Girl*, W. Frampton (three-quarters interest) and E. J. B. Irving (one-quarter interest); *Iolanthe Nos. 1, 2, 3, 4, 5*, and *Country Girl Nos. 1, 2, 3*, owned by E. J. B. Irving, A. N. Gibbs, L. F. Tyson, and T. F. Lean, who have each one-quarter interest in each claim. These claims are all included in the previously mentioned list of mineral claims said to be controlled by the United Lode Mining Company, Limited

### Cultus-Canyon Creek Section.

The properties described below, together with a number of prospects described in previous Annual Reports, are tributary to the Cultus–Canyon Creek trail, which, with the assistance of the Department of Mines and the co-operation of the property-holders, has been constructed from Kootenay lake to the *Spokane* during the last few years. Access by this trail, which is gradually being improved, has thus been afforded to the properties which had been seriously handicapped through lack of adequate transportation facilities. The trunk trail 18 miles in length is also the natural outlet for the Bayonne camp, including the territory at the headwaters of Summit creek, which was formerly reached by trail over the divide from Sheep creek.

Additional information regarding the mines and prospects in the area served by the trunk trail is contained in the Annual Reports of the Minister of Mines for 1915 and 1917.

**Spokane.*** This property, consisting of the *Granite*, *Spokane*, *Spokane No. 1*, *Continental*, *International*, and *Timberline*, owned by R. M. and K. K. Laib, is situated at the head of the main South fork of Canyon creek, 18 miles by trail from Kootenay lake. The *Spokane* group is described by J. D. Galloway in the Annual Report for 1915 and by A. G. Langley in the Annual Report for 1917. Since the last mention a small amount of underground work has been done at intervals. A brief description of the property, including results of development up to date, are as follows:—

The claims are located on the steep hillside which rises up from the creek at slopes of from 30° to 35°. Climbing the hillside diagonally, the main vein, on which most of the work has been done, is a well-defined and persistent quartz-filled fissure striking east and west across granodiorite of the Bayonne batholith. The vein, which has an average width of from 2½ to 3 feet, dips at about 80° to the south, or out of the hill. It is exposed on the *Spokane* and adjoining Harris property by open-cuts at intervals for a distance of roughly 2,000 feet.

The quartz is mineralized with iron pyrites, galena, small amounts of zinc-blende, and occasional chalcopyrite, with free gold in the oxidized portions of the vein. The commercial values are in gold, silver, and lead. In the underground workings the whole vein is considerably leached and oxidized and has a rusty-red appearance from the amount of iron oxide present. inclusions of granite in all stages of alteration indicate that the vein is, in part at least, of replacement origin. Mica-minette dykes, which cut the vein at right angles in places, do not affect it to any appreciable extent.

At an elevation of about 6,235 feet the upper tunnel is a crosscut for the first 27 feet and then continues as a drift to the west for about 120 feet. A small amount of stoping was done at the inner end of the drift.

The lower tunnel, at an elevation of 6,100 feet, starts as a crosscut for 135 feet until the vein is reached and then drifts extend 22 feet to the east and about 300 feet to the west. In the west drift, about 200 feet from the crosscut, a raise goes up about 50 feet, from which a small amount of stoping was done.

Throughout the two tunnels the mineralization in varying degree is continuous. An assay plan of the upper tunnel supplied by the Laib Bros. shows an average assay of: Gold, 0.32 oz. to the ton; silver, 6.1 oz. to the ton; lead, 8.1 per cent., over an average width of 2.9 feet and a length of 120 feet. At the time Galloway reported on the *Spokane* the upper tunnel drift was in 95 feet and an average sample taken by him of the whole rock-dump that came out of the working assayed: Gold, 0.6 oz. to the ton; silver, 7.8 oz. to the ton; lead, 8.1 per cent. In the lower tunnel west drift the same assay plan indicates two shoots of better-grade material, with lower-grade mineralization throughout the rest of the working. The first shoot, encountered a short distance from the crosscut, is about 75 feet long and according to the plan has an average value of: Gold, 0.10 oz. to the ton; silver, 5 oz. to the ton; lead, 8.2 per cent., over an average width of 3.9 feet. The low gold content in this computed average may be attributed to some wide samples having included a horse of granite where the vein splits. Samples confined to the ore are said to have given much better gold values.

The second shoot, encountered about 170 feet from the crosscut, is about 60 feet long and, according to the assay plan, has an average value of: Gold, 0.28 oz. to the ton; silver, 7.9 oz. to the ton; lead, 11.4 per cent., over an average width of 1.9 feet.

Shipments of sorted ore from the above workings, aggregating some 150 tons, were made at intervals in small car-load lots between 1915 and 1918, the ore being packed over the divide to the Sheep Creek wagon-road. Smelter returns for six lots of this ore assayed as follows:—

Net weight, 21,450 lb.: Gold, 0.12 oz. to the ton; silver, 48.5 oz. to the ton; lead, 71.2 per cent.
Net weight, 58,235 lb.: Gold, 0.56 oz. to the ton; silver, 31.5 oz. to the ton; lead, 44.5 per cent.
Net weight, 7,437 lb.: Gold, 0.50 oz. to the ton; silver, 31.2 oz. to the ton; lead, 47.1 per cent.
Net weight, 82,040 lb.: Gold, 0.72 oz. to the ton; silver, 15.5 oz. to the ton; lead, 15.7 per cent.
Net weight, 48,769 lb.: Gold, 0.74 oz. to the ton; silver, 13.0 oz. to the ton; lead, 12.4 per cent.
Net weight, 41,434 lb.: Gold, 0.16 oz. to the ton; silver, 32.5 oz. to the ton; lead, 57.8 per cent.

Since the property was described in the 1917 Annual Report a new intermediate tunnel 40 feet below the upper tunnel has been driven. It starts as a crosscut for 25 feet, striking the vein 14 feet below the surface, and continues as a drift to the west for a distance of about 90 feet, at which point it is under the easterly end of the drift in the upper tunnel. A little stoping was started at the crosscut and continued for a length of 35 feet along the drift. Throughout the stope, which is nearly through to the surface, the vein is from 3 to 4 feet wide and well mineralized. The character of the ore is clean galena and carbonates in oxidized quartz. A sample across 2 feet of oxidized vein at the western end of the stope assayed: Gold, 0.32 oz. to the ton; silver, 3.1 oz. to the ton; lead, 3.1 per cent.; zinc, 1.5 per cent. Between the west end of the stope and the face of the drift the vein is well mineralized between several narrow mica-minette dykes which, without having any appreciable effect on the vein, cut across the drift at right angles.

A sample across 20 inches of oxidized vein in the face of the drift assayed: Gold, 0.36 oz. to the ton; silver, 8.7 oz. to the ton; lead, 16.8 per cent.; zinc, 0.45 per cent. In this intermediate tunnel occasional spots of chalcopyrite and copper carbonates were noted.

Another recent working is a tunnel, gaining a depth of about 80 feet on the former lowest tunnel, which has been driven 35 feet in along the vein from the surface. In this tunnel the vein is narrow, which condition has always prevailed near the surface, but well defined and mineralized in places. A sample across 12 inches 5 feet back from the face assayed: Gold, 0.34 oz. to the ton; silver, 5.9 oz. to the ton; lead, 7.5 per cent.; zinc, 0.7 per cent.

From the work done, which has not yet definitely blocked out the ore, there is a reasonable expectancy of winning a fair tonnage, possibly 10,000 tons, of ore of milling grade between the two main tunnels and the surface, while the vein in the new low tunnel gives promise of additional tonnage at increased depth. West of the underground workings open-cuts prove the continuity of the vein for a considerable distance. The above-described vein can be developed by tunnelling for an additional depth of several hundred feet to the east.

Another vein parallels the main vein several hundred feet to the south. The small amount of work done indicates a fissure-vein of the same character and containing similar mineralization. Samples from this vein gave the following assays:—

| Description. | Gold. | Silver. | Lead. | Zinc. |
|---|---|---|---|---|
| | Oz. to Ton. | Oz. to Ton. | Per Cent. | Per Cent. |
| Selected galena from 10-foot tunnel | 0.08 | 74.8 | 73.8 | 0.2 |
| Selected carbonates from 10-foot tunnel | 0.98 | 45.7 | 29.4 | 0.6 |

Another vein to the north of the main vein is indicated by float-ore composed of the same gangue and mineralization.

The showings on the property fully warrant further development with a view to the installation of a mill which is necessary to handle the output of the mine to the best advantage. A good mill-site could be located on Canyon creek at no great distance from the mine.

For a long time transportation conditions formed a serious handicap to the mine, but this condition is being remedied through the gradual improvement of the Cultus-Canyon Creek trail, 18 miles in length, which affords an outlet to Kootenay lake on a good grade.

**North Wind.*** This property, consisting of the *North Wind*, *Caribou*, *Arkansaw*, and *Canyon Creek*, owned by W. B. McCreath and L. E. Borden, is situated about 2 miles easterly from the *Spokane* mine on the opposite side of the creek. The veins developed are also well-defined quartz-filled fissure-veins in granodiorite and the character of the mineralization is very similar, though there is less oxidation in evidence. The strike of the

veins, however, is north and south, the dip being approximately vertical. A little work has been done at two widely separated points on the heavily wooded side-hill sloping to the creek.

At the southern end of the area examined there is a shallow shaft, about 6,300 feet above sea-level, which was full of water. At the top of the shaft the vein is from 1½ to 2½ feet wide. A sample from the dump of material derived from the shaft assayed: Gold, 0.10 oz. to the ton; silver, 5.9 oz. to the ton; lead, 4.5 per cent.; zinc, 8.1 per cent.

Some 3,000 feet (estimated) to the north and at about 6,150 feet elevation another shallow shaft develops a vein 2½ feet wide, containing disseminated galena, pyrite, and zinc-blende through leached and oxidized quartz and altered country-rock. A sample across 2½ feet on the south side of this shaft assayed: Gold, 0.28 oz. to the ton; silver, 1.4 oz. to the ton; lead, 2.8 per cent.; zinc, 0.6 per cent. On the north side of the shaft samples across 3 inches of ore on the hanging-wall and 12 inches on the foot-wall, separated by 15 inches of altered granite, assayed respectively: Gold, 0.56 oz. to the ton; silver, 1.7 oz. to the ton; lead, 1.6 per cent.; zinc, 0.4 per cent.; and: Gold, 0.54 oz. to the ton; silver, 2 oz. to the ton; lead, 3.6 per cent.; zinc, 2.3 per cent.

Going northerly along the outcrop about 300 feet and at an elevation of about 6,250 feet, an open-cut has been made in the same vein, exposing 20 inches of similar ore, which gave an average assay of: Gold, 0.78 oz. to the ton; silver, 1.5 oz. to the ton; lead, 4.5 per cent.; zinc, 0.5 per cent. Other open-cuts north and south of the workings mentioned trace the vein for some distance. The veins in the superficial workings are well mineralized and, judging from the results of the development done at the *Spokane* property where the main vein was narrow and tight at the surface, are likely to increase in width at depth. The overburden is deep in places and only comparatively short sections of the outcrop of the veins have been prospected.

**Humdinger and Hunkadora.*** These claims, owned by C. O. Woodrow, W. R. Hunter, R. M. and K. K. Laib, are on the trunk trail in the low pass between Cultus and Canyon creeks, about 9 miles from Kootenay lake. While building the trail some copper ore was found and an open-cut was made exposing a width of 7 feet of chalcopyrite disseminated through a siliceous and calcareous gangue. The mineralization is uniformly distributed throughout the showing. At the time of this examination neither wall was exposed and there was no indication of the limits of the deposit, which is along the general trend of the mineralized zone developed on the *Cultus Creek* group described in the Annual Report for last year.

A grab sample from a pile of representative ore on the dump of the open-cut assayed: Gold, 0.06 oz. to the ton; silver, 2.4 oz. to the ton; copper, 4.58 per cent. An analysis of the gangue showed it to contain 60.6 per cent. silica, the balance being chiefly lime and alumina. No country-rock exposures were visible and the small amount of digging was not sufficient to afford much information as to the character of the deposit. The showing is attractive and its accidental discovery demonstrates the interesting prospecting possibilities of the area. There is a large territory in the Cultus-Canyon Creek section which has only been slightly prospected.

List of Producing Mines in Nelson Mining Division, 1927.

| Mine. | Locality. | Tons. | Character of Ore. |
|---|---|---|---|
| Alice | Creston | 22 | Silver-lead-zinc. |
| Goodenough | Ymir | 1,306 | Gold-silver-zinc-lead. |
| H.B. | Salmo | 656 | Lead-zinc-silver-gold. |
| Hunter V. | Ymir | 5,416 | Silver-gold. |
| Kootenay Belle | Salmo | 149 | Gold-silver. |
| Molly Gibson | Kokanee mountain | 100 | Silver-lead-zinc-gold. |
| Queen Victoria | Beasley | 33 | Silver-copper. |
| Silver Reef | Nelson | 3 | Silver-zinc-lead. |
| True Fissure | Rover creek | 26 | Silver-zinc-lead-gold. |
| Yankee Girl | Salmo | 17,752 | Gold-silver-lead-zinc. |

## TRAIL CREEK MINING DIVISION.

At the Rossland camp no new developments are reported by the Consolidated Mining and Smelting Company. About 100 men were employed. The town, which has now become a residential suburb of Trail, is well occupied and business is reported to be in a healthy condition.

In anticipation of increased population the city reservoir has been greatly enlarged and extensive improvements have been made to the Rossland–Trail road.

Outside of the operations of the Consolidated Mining and Smelting Company, mining activities were principally confined to the group of high-grade gold properties adjoining the *I.X.L.* On the *O.K.*, which adjoins this property to the west, exploration was persistently carried on by a local syndicate in an endeavour to pick up the westerly extension of the vein. At the time of the writer's visit no conclusive results had been obtained. After a careful study of the conditions no definite conclusions could be arrived at as to where future work might best be directed. In fact, it is one of those cases in which "the ore is where you find it." On the *Midnight*, which adjoins the *I.X.L.* to the east, a considerable amount of work has been done by another local syndicate. Here broken segments of the vein had been encountered and a little high-grade ore had been mined from a short length.

In both cases the persistent efforts that have been made are certainly deserving of success. Further work was also done on the *Golden Drip*, which adjoins these properties to the south.

Further prospecting-work had been done on the *Blue Elephant*, owned by George W. Urquhart, of Rossland, and at the *Lord Roberts*, owned by John Sinskowski, of Rossland. Both of these properties are situated at a short distance north of Rossland. The results so far obtained are inconclusive, although there is evidence of mineralization, which occurs in a sheeted zone. As far as could be ascertained in the field, the formation consisted of highly metamorphosed rocks of the Mount Roberts formation. The values are in gold, silver, and copper.

Prospecting was also undertaken by J. B. Paul, of Rossland, at the *Good Hope*, which is situated on the Cascade road at a distance of about 5½ miles from Rossland. Here a 76-foot tunnel had been driven to prospect a quartz vein at a short distance below the road. Sampling indicated small values in gold and silver.

### Trail Reduction-works.

Relative to the many additions and improvements made to the plant during 1927 the following information has been submitted by the Consolidated Mining and Smelting Company:—

*Copper-smelter.*—During the year the blast-furnace was replaced by a reverberatory furnace, 60 by 18 feet inside dimensions. This furnace is fed with concentrates containing 10 per cent. moisture and has a smelting capacity of from 250 to 300 tons of solid charge in 24 hours. The matte produced contains 40 to 45 per cent. copper, and the slag 40 per cent. silica, 21 per cent. iron, and 11.5 per cent. lime.

*Lead-smelting Plant.*—An additional 100-ton drossing-furnace and a 100-ton casting-pot are under construction at the drossing plant. Three bays (48 feet) have been added to the drossing-plant building to accommodate this equipment.

*Lead-sintering.*—The capacity of the primary machines has been more than doubled by increasing their length from 264 to 300 feet. A new Cottrell plant of the plate-type flue system for treatment of the gases from the sintering plant was put into operation during the year. This plant is capable of treating 400,000 cubic feet of gas a minute. The stack through which the gases finally escape to the atmosphere is of reinforced concrete and has a height of 400 feet, with an inside diameter of 25 feet.

*Lead-refinery.*—The most recent addition to this plant increased its capacity by 50 tons, bringing the total up to 425 tons a day of refined lead.

*Electric Furnace.*—A 1,500-kw., 3-phase electric furnace with a rated capacity of 30 tons a day was put into operation during the year. This is being used experimentally in connection with the treatment of the leached residue from the electrolytic zinc-refinery. The product is a mixed lead and zinc fume and an impure pig-iron.

*Electrolytic Zinc-refinery.*—The following additions were made to plant and equipment during the year, increasing the capacity from 200 tons to 300 tons of refined zinc a day: In the Roaster division six 25-foot 7-hearth mechanical Wedge roasting-furnaces were installed, also a Hardinge powdered-coal unit to replace hand-firing. In the Leaching division nine large Dorr tanks were installed and in the new tank-room 180 electrolytic cells. Direct current for this plant is generated by five rotary converters with necessary transformers and switch equipment. This plant is housed in a steel and concrete building, ventilated by a modern air cooling and purifying system.

*Customs Concentrator.*—A new crushing plant which is in course of construction will be equipped with a 24- by 36-inch jaw-crusher, a 10-inch Allis-Chalmers finishing-crusher, and one set of 60- by 24-inch Traylor rolls. The rated crushing capacity of the plant is 100 tons an hour to ¼-inch mesh.

A new wash and dry room was built during the year. The building is a three-story fire-proof structure containing 700 steel lockers, lavatories, showers, etc.

Particulars of the tonnage treated is given as follows:—

| Tons of Ore treated. | Customs Ore. | Company Ore. | Hunter V. as Flux. |
|---|---|---|---|
| To October 31st | 120,271 | 325,926 | 2,025 |
| November and December (estimated) | 24,000 | 66,000 | 4,000 |
| Totals | 144,271 | 391,926 | 6,025 |

The number of men employed by the company at the plant is given as 2,600.

What promises to be an important addition to these immense reduction-works is an electrolytic cadmium plant, capable of treating 15 tons of zinc-dust purification residue a day, which was put into operation during the year.

**Mountain Chief.*** This property, consisting of the *Mountain Chief* (Crown-granted), *Morning Glory*, *Calgary*, and *Morning Glory Fraction*, is situated on the eastern side of Dog creek, about 3 miles from Renata on the Lower Arrow lake. It is very conveniently situated to transportation facilities, the distance from Renata being about 2½ miles by road to the ore-bins at the lower terminal of the aerial tram, 3,250 feet in length, to the mine. A steamer service is operated on the lake by the Canadian Pacific Railway, connecting Renata with Robson, the terminal point of the company's railway, connecting with the Trail smelter. When shipments were made between 1917 and 1922 ore was hauled to the lake-shore for 50 cents a ton.

The main workings are situated on the western slope of the mountain, some 600 or 700 feet (estimated) vertically above Dog creek, and about 1,100 feet above Lower Arrow lake.

The property was operated by the Mountain Chief Mining Company from 1917 to 1920. This company was incorporated with a view to acquiring the property and securing the necessary capital to develop and operate the mine. After spending some $30,000 on development and equipment, according to reports, the company was obliged to surrender its lease and bond owing to shortage of funds. During the period of operations the company shipped some 1,220 tons of crude ore, and, in addition to a small amount of inconclusive development-work, equipped the property with the aerial tram (overhead cable, 13 buckets) 3,250 feet in length and ore-bins, erected bunk-house and cook-house to accommodate twenty-five or thirty men, blacksmith-shop and engine-room, and installed a domestic water-supply. Other equipment left on the property includes three rock-drilling machines, air-receiver, air-hoist, tracks, cars, etc.

Time did not permit of a detailed examination of the surface geology, few rock-exposures being visible outside the workings. The *Mountain Chief* deposits, of replacement type, occur in altered silicified limestone strata which apparently constitute inclusions in the alkali-granitic intrusive rocks, which form a wide band along the western side of the Lower Arrow lake. The ore consists of chalcopyrite, bornite, malachite, and azurite, with some associated iron pyrites, in a highly siliceous gangue.

The deposits occur in fissured zones in the limestone country-rock, the mineralization being probably closely related to the adjoining intrusive rocks and dykes connected with them. It is probable the deposits were caused by hot mineral-bearing solutions which attended the close of the period of volcanic activity. These solutions, following the fissures in the country-rock as channels, percolated through it and, meeting with changed conditions of temperature and pressure, deposited their load of vein-matter and metallic sulphides, replacing with this material the original country-rock. The mineralization, therefore, would be concentrated where the nature of the rock afforded the readiest access to the mineralizing solutions. The lines of fracture being irregular and numerous, the mineralizing agent did not confine itself to any one or the same ones. Sometimes the blocks of rock between fractures were entirely replaced by

ore, sometimes they remain as "horses" in the leads. The ore-deposits consequently may be expected to be irregular, and if any rule is to be applied to their exploitation, it is to follow ore.

Surface development consists of a shallow shaft and a large amount of stripping and open-cut work along the trend of the mineralization in a north-easterly direction up the hill. The principal surface working consists of a big trench 135 feet long, with a face up to 30 feet high, from which most of the ore shipped, aggregating approximately 1,322 tons gross weight, was extracted.

At the southerly end of the big trench a 7- by 9-foot incline shaft was sunk 110 feet by the above-mentioned company. This shaft was apparently sunk in the foot-wall of the "lead" and did not follow ore throughout. On the 50-foot level, where ore is reported to have been encountered, a tunnel was driven northerly 36 feet, at which point an incline raise connects with the big surface trench. The ground encountered in this raise is reported to have been soft, earthy oxidized material containing some mineralization and stringers of coarsely crystalline calcite. No crosscutting or exploration-work was done in the shaft below the 50-foot level. The shaft-workings could not be examined, however, being full of water.

The ore visible among the debris in the big trench consists chiefly of disseminated copper sulphides of milling grade, with included ribs and streaks of higher-grade material. A sample of broken ore representing the last-mentioned material assayed: Gold, 0.01 oz. to the ton; silver, 1.8 oz. to the ton; copper, 7.61 per cent.

A grab sample from a big pile of ore by the side of the road at the lower tram terminal assayed: Gold, 0.02 oz. to the ton; silver, 2.6 oz. to the ton; copper, 10.6 per cent.

Total shipments recorded between 1917 and 1922 aggregated about 1,342 tons of ore. Of this, 122 tons shipped in 1922 by M. McDaniels, representing the owners, gave the following assay and analysis: Gold, 0.01 oz. to the ton; silver, 2.20 oz. to the ton; copper, 5.18 per cent.; silica, 48.90 per cent.; alumina, 8.40 per cent.; iron, 9.80 per cent.; lime, 11.70 per cent.; magnesia, 1.80 per cent.; sulphur, 1 per cent.

Another large lot shipped by him in the same year is reported to have assayed: Silver, 3 oz. to the ton; copper, 6.5 per cent. (Smelter returns for this shipment were not seen by the writer.)

It would seem that the development-work done has not been brought to full conclusion, possibly because there was not sufficient information concerning the character of the deposit. The underground work undertaken was premature, in the writer's opinion, the superficial extent of the deposit not having been fully explored. Now that the shaft has been sunk, however, a small amount of exploratory work on the 100-foot level should test the continuity of the ore at depth.

The possibilities of the property for tonnage are indicated by the promising surface showings and from the fact that over 1,300 tons were extracted from a shallow depth in the big trench in which the mineralization is still strong.

The future of the property would seem to depend ultimately on the blocking-out of sufficient tonnage to justify milling plant, and with that end in view the property has possibilities which make it worthy of more thorough and systematic development. The shipping facilities are excellent, timber for mining purposes is plentiful, and water-power could be economically developed in the vicinity. The camp buildings are reported to have been repaired recently by M. McDaniels.

The above report was made in accordance with the provisions in aid to prospectors under subsections (*a*), (*b*), and (*e*) of section 10 of the "Mineral Survey and Development Act."

List of Producing Mines in Trail Creek Mining Division, 1927.

| Mine. | Locality. | Tons. | Character of Ore. |
|---|---|---|---|
| Centre Star and Le Roi | Rossland | 15,415 | Gold-copper-silver. |
| I.X.L. | Rossland | Tailings | Gold. |
| Midnight | Rossland | 28 | Gold-silver. |
| Velvet | Rossland | 7 | Gold-silver-copper. |

## ARROW LAKE MINING DIVISION.

**Big Ledge.** This property, comprising some thirty claims, was acquired in the late fall of 1926 by the Butler interests of Los Angeles and Duluth. After establishing camps and getting things in readiness for underground work it was decided to diamond-drill the property. This work was started about the beginning of the year and ended in March, which is about the most unfavourable time of year that could possibly be chosen to undertake work of this nature. Altogether 3,400 feet of drilling was done. A. St. Clair Brindle, who was largely responsible for getting the above-mentioned people interested, has kindly supplied the following information regarding the results of the drilling, which is as follows:—

"An analysis made of the widths of ore sampled by Mr. White of the drill-cores, including tunnel and surface sampling on Fowler's group, shows an average width of 17.8 feet.

"The average percentage of first-grade samples of zinc (including 'fines' in holes 2 and 3, but omitting holes 9 and 10, driven on foot-wall only) equals 11.46 per cent. zinc over 6 feet. The average next best (omitting holes 4 and 5, known to be incorrect) equals 6 per cent. zinc over 4 feet. The average of third grade equals 3.69 per cent. zinc over 4 feet.

"Average of Nos. 1 and 2 combined equals 8.73 per cent. over 10 feet and average of Nos. 1, 2, and 3 combined equals 7.05 per cent. over 14 feet, throughout all the area drilled. Sampling by Marcus White, a mining and metallurgical engineer, Boise, Idaho."

In connection with the above results it may be mentioned that the ore is of a banded structure, which partly explains the different grades, some bands being of higher grade than others. The mineralization occurs in a zone of considerable width which can be traced for about 5 miles, according to Mr. Brindle. Further reference may be seen in the Annual Report for 1923.

**Bluebird.** This property, situated about 1½ miles from Nakusp and a short distance from the wagon-road, belongs to J. H. Vestrup and associates, of Nakusp. The workings consist of a prospect-tunnel driven for about 120 feet in an easterly direction. The formation composing the low bench in which quartz-outcroppings are exposed in the bank of the creek consists of slate-schists. The tunnel, which follows a quartz vein, discloses the formation to be faulted and broken. Near the face sheared and crushed slates with a fair percentage of broken quartz show mineral indications and small pieces of ore have been encountered. More uniform conditions may be found to exist farther in the hill, in which direction a little more prospecting would appear to be warranted.

# WESTERN MINERAL SURVEY DISTRICT (No. 6).

By George A. Clothier, Resident Mining Engineer.

## INTRODUCTORY.

The Western Mineral Survey District (No. 6) includes the Victoria, Alberni, Clayoquot, Quatsino, Nanaimo, Vancouver, and New Westminster Mining Divisions. These include all Vancouver island and the Coast islands, and on the Mainland to the summit of the Coast range east of Harrison lake and north to Seymour inlet.

For the purposes of this report these Divisions are subdivided into sections as follows:—

Victoria Mining Division—Sooke section; Jordan River section; Cowichan Lake section; Mount Sicker section.

Alberni Mining Division—Alberni Canal section; Barkley Sound section; Sproat and Great Central Lakes section.

Clayoquot Mining Division—Kennedy Lake and Elk River section; Tofino Inlet section; Bedwell Sound section; Sidney Inlet section; Hesquiat Lake section; Muchalat Arm section; Tasis Canal section; Esperanza Inlet section.

Quatsino Mining Division—Kokshittle Arm section; Quatsino sound, South-east Arm section; Quatsino sound, West Arm section.

Nanaimo Mining Division—Nanaimo River section; Cameron Lake section; Horne Lake section; Buttle Lake section; Port Hardy section; Islands section; Phillips Arm section; Frederick Arm section; Powell River section; Texada Island section; Lasqueti Island section.

Vancouver Mining Division—North Vancouver section; Howe Sound section; Pacific Great Eastern Railway section; Indian River section; Jervis Inlet section.

New Westminster Mining Division—Pitt Lake section; Harrison Lake section; Chilliwack River section.

It will be seen that there are within this district two distinct areas so far as geological conditions are concerned; that is, the western flank of the granodiorite Coast range with its mineral possibilities evidenced by the *Britannia* property, Howe sound; and the Vancouver Island range, the potentialities of which are being demonstrated in the *Sunloch* and *Gabbro* groups in the southern portion of the island and in the property of the Coast Copper Company in the north on Quatsino sound.

The natural facilities of water transportation, water-power, and timber are ideal for all mining operations from prospecting to the shipment of ore. That prospecting is not altogether a lost art is shown by the fact that there are about 1,500 un-Crown-granted mineral claims and as many or more Crown-granted properties in the district. The great detriment to this district is that a great many of the mineral claims are held from year to year by restaking, instead of by annual assessment-work which might improve them; and, further, that the great majority of Crown-granted claims held by paying taxes have had nothing done on them for many years and consequently are in the same condition or worse than twenty or thirty years ago. The fact that no producing properties have been developed out of all this array of Crown-granted claims has been discouraging to prospector and operator alike, with the result that they are mining elsewhere. I think that many of these old properties will be very well worth investigating in the light of up-to-date metallurgical methods of treating low-grade ores, such as the flotation process.

This being my first season in this district, I have particularly noticed that only a small percentage of it has actually been prospected. It is noticeable that a great majority of the staked claims are at or at no great distance from the beach. The higher and admittedly more favourable prospecting-ground is therefore untouched, for the reason that it is more inaccessible. The dense undergrowth on the Coast is practically impenetrable without trails. So far as I have observed, there are few trails from the heads of the inlets and up the main tributary streams from tide-water back into the hills. This very serious handicap for both prospector and operator can be greatly reduced by a greater application of the provision of the "Mines Development Act," which has been operated to great advantage throughout the Province.

### Development.

Generally speaking, there has been a serious revival of interest in mining throughout the district as demonstrated by the amount of development-work being undertaken. Properties that have been inactive for many years are receiving attention and I consider that the outlook for the coming year is more promising than for some time past.

On Vancouver island the Cowichan Lake section has had some prospecting and a substantial amount of development has been done by the owners on the *El Capitan* and *Silver Leaf*, both meritorious prospects.

Some further exploratory and preparatory work was done on the old *Tyee* on Sicker mountain, now under option to the Ladysmith Tidewater Smelters, Limited. This company has also optioned other properties on the island in preparation for an active development season in 1928.

I am informed by the owners of the *Morning* group, up Adams river from the head of Sproat lake, that it has been optioned and work will be started in the spring of 1928.

The *Old Sport* group, operated by the Coast Copper Company, has been under continuous operation for several years. This year's improvements are indicative of continued extensive development. This company has also optioned the *Millington* group at Holberg and I understand will explore it by diamond-drilling.

The Caledonia Mines, Limited, has this year completed a road to the property and installed a small power plant and is now in good shape to go ahead on its promising-looking property.

The *Doratha Morton* on Phillips arm was also operated for a short time during the year by the Glasord Mining Corporation, Limited, under R. Crowe-Swords; some further prospecting underground having been done. The company has also prospected the adjacent claims and reports results sufficiently satisfactory to warrant continuation of the work.

The Alexandria Mining Company, owning the *Alexandria* group at the entrance to Phillips arm, has been financed and will proceed with the development of this property early in 1928.

The Malaspina Mines Company, operating on Malaspina peninsula, reports finding a very promising body of ore in underground workings.

The *Britannia* has had its highest production year and the whole plant from the beach to the summit is now in fine condition for the economical mining and handling of ore.

The Consolidated is diamond-drilling the *Rafuse* property near Squamish.

These are mentioned as the most important of the year's mining-work, but there are many other claims being prospected in a small way which, though of no outstanding importance as yet, may make good with work.

Though I have not had time to make many detailed examinations in any one section, rather having tried to get an idea of the whole situation, the general impressions I have gained are that there are many properties worth developing, much area to be prospected, and that with the expansion policies of the Consolidated Mining and Smelting Company and the Britannia Mining and Smelting Company, and the building-up of an organization by the Ladysmith Tidewater Smelters, Limited, this district will see a wonderful progress in the mining industry within a comparatively short time.

### Roads and Trails.

Assistance, totalling a substantial amount, was granted by the Department of Mines during the year for the construction of fifteen roads and trails in different parts of the district. This form of encouragement, coming as it does in the initial stages of opening up a property, just when everything is more or less uncertain, is having a very beneficial effect and is a very important factor in mining.

### References.

I have found, on starting in this new district, that the following publications have been very helpful in obtaining information as to the geological features of the different areas of the district:—

Vancouver Island—

South-east Portion of Vancouver Island, by Chas. H. Clapp. Summary Report, 1908, G.S.C.

Southern Vancouver Island, by Chas. H. Clapp. Summary Report, 1909, G.S.C.

Southern Vancouver Island, by Chas. H. Clapp. Memoir No. 13, 1912, G.S.C.

Vancouver Island—*Continued.*

Nanaimo Map Area, by Chas. H. Clapp. Memoir No. 43, 1914, G.S.C.

Sooke and Duncan Map Areas, by Chas. H. Clapp and H. C. Cooke. Memoir No. 80, G.S.C.

Quatsino Sound and Certain Mineral Deposits of the West Coast of Vancouver Island, by V. Dolmage. Summary Report, 1918, Part B, G.S.C.

Barkley Sound, Vancouver Island, by V. Dolmage. Summary Report, 1919, Part B, G.S.C.

Sunloch Copper District, by V. Dolmage. Summary Report, 1919, Part B, G.S.C.

West Coast of Vancouver Island between Barkley Sound and Quatsino Sound, by V. Dolmage. Summary Report, 1920, Part A, G.S.C.

Gabbros of East Sooke and Rocky Point, by H. C. Cooke. Museum Bulletin No. 30, 1919, G.S.C.

Mainland and Islands—

North-western Portion of Texada Island, by R. G. McConnell. Summary Report, 1908, G.S.C.

Preliminary Report on a Portion of the Mainland Coast of B.C. and Adjacent Islands, by O. E. LeRoy. Publication N. 996, 1908, G.S.C.

Copper Deposits of Lasqueti Island, by J. D. Mackenzie. Summary Report, 1921, Part A, G.S.C.

Britannia Map Area, by S. J. Schofield. Summary Report, 1918, Part B, G.S.C.

Reconnaissance along the P.G.E. Railway between Squamish and Lillooet, also Indian River Copper Deposits, by Chas. Camsell. Summary Report, 1917, Part B, G.S.C.

Annual Reports of the Minister of Mines. Mines Department, Victoria, B.C.

NOTE.—The above publications, except the Annual Reports of the Minister of Mines, B.C., are obtainable from the Geological Survey, Mines Department, Ottawa, Canada.

## "IRON-ORE SUPPLY ACT."

Under the provisions of this Act 20 tons of iron ore was procured from the *Volunteer* on Texada island for shipment to John Grace, Vancouver, B.C., for experimental purposes.

## ESQUIMALT & NANAIMO RAILWAY LAND.

The area within the boundaries of this land-grant comprises about one-third of the total area of Vancouver island. All base metals, copper, lead, zinc, etc., within this area belong to the railway company, leaving only the precious metals, gold and silver, belonging to the Crown. The area is open to prospectors, who may stake mineral claims in accordance with the "Mineral Act," but subject to the regulations laid down by the railway company. A copy of these regulations may be obtained from Newton Ker, Land Agent, Esquimalt & Nanaimo Railway Company, Victoria, B.C.

## INDEX OF MINERAL CLAIMS AND COMPANIES IN DISTRICT.

The following is an index to all the mineral claims, groups of mineral claims, and companies in the Western Mineral Survey District described in the Annual Reports since 1917:—

| Name. | Location. | Annual Report. | Reference. |
|---|---|---|---|
| A.B.C. group | Indian river | 1917 | |
| Alexandria claim | Phillips arm | 1920–22–25–26 | |
| Alexander group | Seymour inlet | 1919 | |
| Alice Lake group | Quatsino sound | 1924 to 1926 | |
| Allies group | Buttle mountain | 1918–22 | |
| Amethyst and Monte Cristo | Fanny bay | 1918–19–20–25 | |
| Anna group | | 1922 | |
| Annie Lou claim | Jones mountain | 1918 | Mary Jane claim. |
| Anzac group | Pitt lake | 1917 | Horseshoe. |
| Arrowsmith group | Cameron lake | 1924 | |
| Astra group | Brandywine creek | 1925–26 | |
| Attorney | Howe sound | 1918 | Attorney Copper Gold Syndicate. |
| Bank group | Mount Douglas | 1917 | Port Alberni. |

INDEX OF MINERAL CLAIMS AND COMPANIES IN DISTRICT—*Continued.*

| Name. | Location. | Annual Report. | Reference. |
|---|---|---|---|
| Baramba Co. | Hotham sound | 1917 | Baramba claim. |
| B.C. Cement Co. | Tod inlet | 1924 | |
| Belle group | Canyon creek | 1917 | |
| Benson claim | Hawkins island | 1918 | |
| Black Bear group | Buttle lake | 1918 | |
| Black Prince group | Shaw creek | 1918 | |
| Black Warrior group | Pryce channel | 1918–19 | |
| Blue Bells group | Frederick arm | 1920–25 | |
| Blue Bird group | Kennedy river | 1923 | |
| Blue Grouse group | Sproat mountain | 1918 | Blue Grouse and Nita. |
| Blue Grouse group | Cowichan lake | 1917–18 | |
| Blue Jack group | Brandywine river | 1924 to 1926 | |
| Blue Mountain group | Whonnock station | 1917 | |
| Bowena group | Bowen island | 1918 | Bowena Copper Mines. |
| Bowerman group | Quatsino sound | 1919–22 | |
| Brandywine group | Brandywine river | 1925–26 | |
| Britannia group | Britannia beach | 1917 to 1926 | Britannia Mining and Smelting Co., Ltd. |
| Britannia Mining and Smelting Co., Ltd. | Britannia beach | 1917 to 1926 | |
| Bruce group | Stawamus river | 1919–21 | |
| Bulliondale | Indian river | 1917 | |
| Caffrey | East Sooke | 1917 | |
| Caledonia group | Kokshittle arm | 1920 | |
| Caledonia group | Caledonia creek | 1923–26 | |
| Callander group | Sproat mountain | 1918 | |
| Canadian group | Alberni canal | 1917–18 | |
| Constitution claim | Thurlow island | 1925–26 | |
| Contact group | Fraser river | 1918 | |
| Copper group | Beaver creek | 1917–20–22–25 | |
| Copper Bowl group | Powell lake | 1921 | |
| Coast Copper Co., Ltd. | Quatsino sound | 1917–19–20–23–26 | |
| Copper King group | Atkins bay | 1922 | |
| Copper King group | Theodosia river | 1926 | Revenue Mining Co. |
| Copper King group | Cameron lake | 1917 | |
| Copper Mountain group | Quadra island | 1918–19 | Valdez Copper Co. |
| Copper Mountain Mining and Development Co. | | | |
| Cornucopia group | Duncan | 1917 | |
| Cougar group | Alta lake | 1918 | |
| Crofton group | McNab creek | 1924 | |
| Dauntless group | Alberni canal | 1918–26 | |
| Dawn group | Thurlow island | 1919–21 | Ladysmith Smelting Corp. |
| Dolly Varden group | Dolly Varden creek | 1923–25 | Silver Chief Mining Co. |
| Doratha Morton | Fanny bay | 1925–26 | Glasair Mining Corp. |
| Eagle claim | Wolf creek | 1919–20–22–23 | |
| Eldorado group | Zeballas river | 1924–25 | |
| Eldorado group | Texada island | 1922 | |
| Eleanor group | Brandywine river | 1925 | |
| Elsie claim | West Redonda island | 1919 | |
| Emerald group | Bowen island | 1919 | |
| Empress claim | Bear river | 1918 | |
| Empress group | Agassiz station | 1917–18 | |
| Eva claim | Koksilah river | 1925 | |
| Florence claim | Malaspina strait | 1917–24 | Malaspina Mines, Ltd. |
| Finlay | Helmcken district | 1919 | |
| Fitzsimmons claim | Mons station | 1918 | |
| Gabbro group | Jordan river | 1919–25 | Consolidated Mining and Smelting Co. |
| Gem group | Kirk lake | 1923 to 1925 | Formerly Nutcracker. |
| Goat Creek group | Rafuse creek | 1925 | |
| Golden King group | Ashloo creek | 1925–26 | |
| Golden Ears group | Chilliwack lake | 1923–25 | Viking group. |
| Good Hope claim | Texada island | 1917–18–23 | |

INDEX OF MINERAL CLAIMS AND COMPANIES IN DISTRICT—*Continued.*

| Name. | Location. | Annual Report. | Reference. |
|---|---|---|---|
| Granby Consolidated Mining, Smelting, and Power Co. | Cassidy | 1917 | |
| Grant group | Kennedy river | 1923 | James Grant claim. |
| Gretna Green group | Henderson lake | 1921 | |
| Grizzly claim | China creek | 1924–26 | |
| Haematite Mining Co. | Chromium creek | 1921 | |
| Happy John group | Alberni canal | 1918 | |
| Hesquiat group | Hesquiat lake | 1925 | |
| Hill 60 group | Cowichan lake | 1918–19 | |
| Horseshoe group | Pitt lake | 1917–26 | |
| Horseshoe group | Howe sound | 1919 | |
| Indian Chief group | Sidney inlet | 1918 to 1925 | Tidewater Copper Co. |
| Ingersoll group | Quadra island | 1920 | Valdez Island Copper Mining Co. |
| Invereck claim | Deception creek | 1922 | |
| John Bull claim | Powell river | 1922–24–26 | |
| Jolly group | Baramba creek | 1917 | |
| Juneau group | Lasqueti island | 1926 | |
| King Solomon group | Fitzsimmons creek | 1918 | |
| Kitchener group | Cottonwood creek | 1919 | |
| Kitchener group | Seymour inlet | 1919 | |
| Krissie group | Henderson lake | 1918 | |
| Lagoon group | Buker creek | 1923 | |
| Last Chance group | Hurling's mountain | 1918–19 | |
| Lenora Mine | Mount Sicker | 1924 to 1926 | |
| Lillie-Groven group | Mount Diadem | 1924 | |
| Limestone-quarry | Marble bay | 1922 | Tacoma Steel Co. |
| Limestone-quarry | Blubber bay | 1922 | Pacific Lime Co. |
| Lucky Boy group | Gillies bay | 1922 | |
| Lucky Four group | Cheam range | 1918–19–25–26 | |
| Lucky Jim group | Adams river | 1918–26 | |
| Lynn Creek Mines, Ltd. | Lynn creek | 1917–26 | Kemptville and Banker claims. |
| Lucky Jim group | Quadra island | 1926 | |
| Magnetite Iron Ore | Ingersoll river | 1922 | |
| Malaspina Mines, Ltd. | Malaspina strait | 1925 | |
| Maple Leaf | Pitt lake | 1926 | |
| Marble Bay group | Texada island | 1920–26 | Tacoma Steel Co. |
| Marble Cove group | Copper island | 1918 | |
| Marjorie claim | Spectacle lake | 1921–22–25–26 | Chickamin Gold Mines, Ltd. |
| Margaret group | Mount Maguire | 1917 | |
| Mary Jane claim | Jones mountain | 1918 | Mary Jane and Annie Lou claims. |
| Mayflower group | Olsen river | 1921 | |
| Mendalla group | Jervis inlet | 1917 | |
| Mesabi group | Mount Sullivan | 1918 | |
| Millington group | Spruce river | 1919–26 | |
| Monarch group | Pitt lake | 1917 | |
| Monte Cristo and Amethyst | Fanny bay | 1918–19–20–25 | |
| Monitor group | Alberni canal | 1917–18 | |
| Morning claim | Taylor river | 1922–23–26 | |
| Mount Skirt group | Mount Skirt | 1924–25 | |
| Mountain Lion group | Lynn creek | 1918 | |
| McKinnon claim | Stawamus valley | 1919 | |
| Nancy Bell group | Texada island | 1921 to 1923 | |
| Nanoose Colliery Co. | Nanoose bay | 1919 | |
| Nigger Baby | Texada island | 1919 | |
| Norman group | Jervis inlet | 1917 | Norman Copper Co. |
| Northern Crown group | Kennedy lake | 1918 | |
| Old Bill group | False bay | 1922 | |
| Old Sport group | Elk lake | 1917–19–20–26 | Coast Copper Co. |
| O.K. group | Kennedy lake | 1918 | |
| Ophir claim | Copper creek | 1917–21–24 | |
| Opporgol claim | Howe sound | 1919–20 | |

INDEX OF MINERAL CLAIMS AND COMPANIES IN DISTRICT—*Continued.*

| Name. | Location. | Annual Report. | Reference. |
|---|---|---|---|
| Ottawa Central claim | Bold point | 1922 | |
| Pacific Lime Co. | Texada island | 1926 | |
| Panther group | Nitinat river | 1918 | |
| Paramount Mining Co. | Buttle lake | 1920–21–22–25 | |
| Pauper claim | Mount Brenton | 1923 | |
| Pay Roll claim | Pitt lake | 1917 | |
| Plato | Granite bay | 1926 | |
| Prince group | Sidney inlet | 1922 | |
| Princess group | Knight inlet | 1918–19 | Princess Ethel. |
| Ptarmigan group | Bear river | 1919–26 | |
| Puget Sound Iron Co. | Texada island | 1922 | |
| Pykett's group | Squamish river | 1924 | |
| Pitt Mining Co. | Pitt lake | 1923–26 | Viking group. |
| Quartz-Alunite Rocks | | 1920 | |
| Quatsino King group | Teta river | 1917 | |
| Radiant group | Stawamus river | 1921 | Bruce and Radiant. |
| Radioactive ores | Quadra island | 1922 | |
| Rafuse group | Rafuse creek | 1925 | |
| Red Cap group | Phillips river | 1920 | |
| Red Cliff group | Sutton trail | 1923 | |
| Red Jacket group | Jervis inlet | 1917 | Red Jacket and Prospector. |
| Red Robin claim | Vananda | 1919 | |
| Retriever claim | Surprise mountain | 1917–18 | |
| Revenue Mining Co. | Theodosia river | 1926 | Copper King. |
| Richard the Third | Mount Sicker | 1924–25 | |
| Robertson mine | Koksilah river | 1917 | |
| Rose group | Elk river | 1919–23–25 | |
| Rose Marie | Elk river | 1918 | Rose group. |
| Roy group | Indian river | 1917 | |
| Royal Arch claim | Malaspina strait | 1924 | Malaspina Mines, Ltd. |
| Santa Anna group | Quadra island | 1919 | |
| Saucy Lass group | Cascade creek | 1920 | |
| Scotch group | Mount Sicker | 1920 | |
| Sentinel group | Texada island | 1921 | |
| Shoo Fly claim | Fanny bay | 1922 | |
| Shushartie Bay Placer | Shushartie bay | 1922 | |
| Silver Chief Mining Co. | Chilliwack lake | 1923–26 | Dolly Varden group. |
| Silver Leaf group | Jump creek | 1922 | Silver Leaf Syndicate. |
| Silver Leaf group | Cottonwood creek | 1919–26 | |
| Snug Copper Co. | Bowen island | 1919 | |
| Solomon claim | Reade island | 1922 | |
| Spider claim | Discovery passage | 1925 | |
| St. Joseph group | | 1921 | |
| St. Paul claim | Jervis island | 1922 | |
| Star of the West | Tasis canal | 1922–25–26 | |
| Stave River group | Stave river | 1918 | |
| Steel Trust group | Pitt lake | 1917 | |
| Stromberg group | Davies bay | 1918–25–26 | |
| Sudbury-Pacific group | Barkley sound | 1917 | |
| Sun group | Seymour creek | 1917 | Sunlight, etc. |
| Sunbeam group | Sooke river | 1924 | Sunbeam Mining Co. |
| Sunbeam group | Frederick arm | 1923 | |
| Sunloch group | Jordan river | 1917–20–22–25 | |
| Sunnyside group | Sutton creek | 1917 | |
| Sunshine group | Goat creek | 1924 | |
| Sunshine claim | Cascade creek | 1918 | |
| Tatlayoko Lake section | | 1920 | |
| Tatlayoko Lake Gold Mining Co. | Homathko river | 1921–22–23 | |
| Three Jays group | Alberni canal | 1918 | |
| Tidewater group | Fanny bay | 1922 | |
| Union group | Knight inlet | 1919 | |
| Van Anda Copper Gold Co. | Texada island | 1919–22–25–26 | |
| Vanbert claim | Copper creek | 1917 | |
| Venus group | Lasqueti island | 1920–26 | Lasqueti Mining Co. |

Goodenough Mine, Nelson M.D.

Goodenough Mine, Nelson M.D.—Lower Tunnel.

Buttle Lake, Vancouver Island—Looking South.

INDEX OF MINERAL CLAIMS AND COMPANIES IN DISTRICT—*Continued.*

| Name. | Location. | Annual Report. | Reference. |
|---|---|---|---|
| Victoria group | Alberni canal | 1917 | |
| Viking group | Pitt lake | 1923–25 | Golden Ears group. |
| Vulcan group | Jordan river | 1918 | Sunloch and Vulcan. |
| Vulcan group | Alta lake | 1918 | Cougar group. |
| W.W.W. group | China creek | 1921–22 | |
| Wanderer group | Deepwater bay | 1921–23 | |
| Wanderer group | Quadra island | 1920–21–22–26 | Wyho claim. |
| White group | Deer creek | 1918–22–25–26 | |
| Wyho claim | Quadra island | 1926 | Wanderer. |
| Willow Grouse group | Mount Maguire | 1917 | |
| You group | Strathcona park | 1921 to 1923 | |
| Ypres group | Comox section | 1918 | |
| Zone claim | Malaspina strait | 1917 | |

## VICTORIA MINING DIVISION.

This Division, comprising the whole south end of Vancouver island, has had a very inactive year in mining, especially in the Sooke and Jordan River sections, where the *Sunloch, Gabbro,* and other copper properties are situated. There has been no mining in these sections other than extensive claim-staking.

North of these properties, in the Cowichan Lake and Mount Sicker sections, there has been some little development-work with more prospecting and claim-staking.

**El Capitan.** This group is owned by the El Capitan Syndicate, of Duncan, and is under the direction of Edward F. Miller. The property heretofore consisted of only one claim, the *El Capitan,* but in 1927 a claim was staked on each end, the *El Capitan* and *El Capitan Nos. 2* and *3* now forming the group. They are situated on the ridge between the heads of the Chemainus river and Cottonwood creek, which latter flows into Cowichan lake about a mile above Youbou, the terminal station of the Canadian National Railway.

A small grant was appropriated by the Department of Mines this summer for a trail from the upper end of a now dismantled logging-road up Cottonwood creek, up to the showings on the summit at 4,300 feet elevation; this has made the property much more accessible than by way of the old trail leading to the *Silver Leaf* group. A comfortable log cabin was built at the outlet of a small lake at 3,850 feet elevation, from which there is a good trail to the workings above. It is about a five-hour walk from Youbou to the mine camp.

The work done previous to December, 1927, consisted of a little surface-stripping and a tunnel about 6 feet long, driven on an intensely oxidized vein about 20 inches wide, from the top of the rock-slide. There is another vein 15 feet north of this, consisting of a few inches of oxides. These veins can be traced up to and over the apex of the mountain 100 feet higher. They occupy a shear-zone in the andesitic rock of the Vancouver volcanics series, striking east-west (mag.) and dipping slightly to the south. This year another tunnel was started about 10 feet lower than the small one mentioned and driven in on the vein about 50 feet. The vein shows the same intense oxidation all the way through and opens up about half-way in the tunnel to a width of 6 feet, apparently caused by the junction of a small cross-vein with the main vein at a small angle. A sample across here by the owners gave assay returns of $15 a ton, mainly in gold values. A couple of small ribs of sulphides were encountered, which it is interesting to note assayed $39 a ton in gold, indicating apparently that the gold values in the sulphides are even better than in the oxidized material, where residual gold would be expected to give higher values than found in the primary ore. Beyond the wide place in the vein it narrows down and about 5 feet from the face splits into two small veins of oxides. The tunnel obtains a depth of approximately 100 feet below the apex of the hill and, as stated, is still in oxides. Because of the encouragement so far gained, it has been decided to drop down another 75 or 100 feet and tunnel through the rock-slide to the vein in an endeavour to get below the oxidation horizon. I think this work is fully warranted from results obtained so far.

A number of small cross-veins well mineralized with chalcopyrite have been picked up on the surface; these will very probably have a beneficial effect on the size of and values in the main vein at points of intersection.

It has been suggested that the ore already in sight might be mined and treated by cyaniding at a profit, but I think even a small plant would be premature until deeper development-work establishes the continuity of the vein and the nature and value of the primary ore, which will doubtless require an altogether different treatment.

**Cottonwood.** This claim is owned by M. L. Douglas and partners and is situated along the new trail to the *El Capitan* camp at an elevation of 3,800 feet. It was staked this season and the owners had only time to do a little surface prospecting by way of tracing the vein up the hill for a distance of 500 feet or more. It strikes N. 45° E. (mag.) and dips west at a steep angle, and therefore is a different shearing than the *El Capitan*, though in the same volcanic formation.

A few shots in one place disclosed the full width of the vein of about 6 feet, about half of which is solid and the other half strongly oxidized. It is heavily mineralized throughout with pyrrhotite and chalcopyrite. A streak down the centre of the vein shows beautiful cobalt bloom; a sample of this material assayed: Gold, $1.60 to the ton; silver, 0.04 oz. to the ton; cobalt, 4.7 per cent.; nickel, *nil*. Some of the pyrite has the light-brown appearance of niccolite, but a sample of it assayed: Gold, trace; silver, trace; copper, 2.5 per cent.; cobalt, 1.1 per cent.; nickel, *nil*. It is an interesting surface showing and the vein warrants opening up at intervals along the surface to select the most favourable place to start a tunnel. The property is well situated for both transportation and development.

**Alpha and Beta.** These adjoining claims are Crown-granted and carry both mineral and surface rights, though lying in the Esquimalt & Nanaimo Railway belt. They are owned by Clifford Terrain, who is not on the ground, and therefore information is procurable from H. March, Cowichan Station P.O., who owns the adjoining claim up the hill, the *Taboga*. The property is situated on the East fork of Robertson creek and about 6 miles up from the mouth of the main creek, which empties into the lower end of Cowichan lake from the south. The showings are at the mouth of a small tributary creek of the East fork, flowing into it from the north.

The claims are reached by the logging-railway of the Victoria Lumbering and Manufacturing Company, Limited, of Chemainus. The railway is being extended for logging purposes and early in September had been graded to within a short distance of the showings, though higher up the hill.

The general country-rock is the Vancouver volcanics with accompanying limestone-belts. The ore-showings occur in a belt probably 100 feet in width of altered rocks, composed mainly of the metamorphic minerals garnetite and epidote, striking north-easterly. The mineralization, which is chiefly chalcopyrite, has a width in places of 6 to 8 feet of good ore. On the west side of the small creek, and therefore on the north wall of the altered belt, old open-cuts disclose some very promising showings of high-grade chalcopyrite ore. Apparently nothing has been done towards tracing these hanging-wall showings northward along the strike of the belt. In the creek and in the bluffs of this east side bunches of chalcopyrite can be seen. Farther east, along the north bank of the East fork, there is a mineralization of scattered chalcopyrite across a width of 20 to 30 feet, concentrated in spots to good ore. Very little work has been done up the hill, nor as far as I could see on the south side of the creek.

The zone impressed me as having considerable possibilities and worth extensive exploration. Appreciable depth could be obtained by crosscutting the zone from a point farther up the small creek, as the hill rises rapidly from the forks of the creeks.

Transportation would be solved by arrangement with the logging company for haulage over the railway.

**Taboga.** This is a Crown-granted claim and, though in the railway belt, carries all mineral and surface rights and is owned by H. March, Cowichan Station P.O. It is situated on the East fork of Robertson creek, adjoining the *Alpha* claim on the north; that is, up the hill. The same contact-metamorphic belt of garnetite and epidote extends through this claim, but insufficient work has been done on it to expose the mineralization to the same extent as on the claims below. The granite is badly decomposed where it is exposed along the bluffs above the creek. This claim should be included with the *Alpha* and *Beta*

claims for development or sale purposes. Two claims were staked in 1927 adjoining the *Taboga* on the north and one adjoining the *Beta* on the south, along the same mineral-belt.

**Hi-Ball.** This claim, staked in 1927 by J. D. Long, of Chemainus, is about half a mile down the East fork of Robertson creek from the *Alpha* and *Beta* claims. There is a small showing of good chalcopyrite ore in volcanic formation near a belt of limestone which shows no alteration on its contact with the igneous rock. No work had been done on the showing, but I considered it worth an assessment at least.

**Blue Grouse.** This group, consisting of three claims, is situated on the south side of Cowichan lake, about 6 miles from the lower end and about 1 mile up the hill from the lake, and is in the Esquimalt & Nanaimo Railway belt. I have not examined the property, but the last descriptive report in the Annual Report for 1917, together with the fact that 1,732 tons of ore was shipped, would seem to indicate possibilities. The Annual Report for 1918 states that satisfactory diamond-drilling was done and 501 tons of ore shipped. In 1919 240 tons was shipped. The property is mentioned for the benefit of readers who have not the early reports.

*Sunnyside.*—This group of two claims, lying west of the *Blue Grouse*, is favourably mentioned in the 1917 Annual Report.

### Mount Sicker Section.

**Tyee.** This and the adjoining groups, the *Lenora* and *Richard III.*, have been described each year in the Annual Reports for several years. A small crew of men was working on the old *Tyee* property in 1927 in preparatory and exploratory work under the supervision of H. Carmichael, of the Ladysmith Tidewater Smelters Company, to which company the property is under option. It is anticipated that some of the low-grade ores which were unprofitable at the time the mine was in operation can now be made available and profitable by treatment at the Company's plant at Ladysmith. Assistance was granted by the Department of Mines towards repairing the old road from the main highway to the mine.

**Pauper.** This claim is controlled by E. F. Miller and associates, of Duncan, and is situated on the east slope of Mount Brenton, on the north side of the Chemainus river, directly opposite the *Tyee*, *Lenora*, and *Richard III.* groups. The logging-railway of the Victoria Lumber and Manufacturing Company, Limited, of Chemainus, runs along the base of the hill at an elevation of about 500 feet.

The general country-rock is the schists of the Sicker series, which belt of sediments and volcanics extends from Saltspring island across Vancouver island to probably the head of the Alberni canal. Here the schists strike east-west (mag.) and dip about 60° to the north. The showings on the claim are at 2,100 feet elevation and the cabin is above these at 2,500 feet elevation. There is a good foot-trail from the railway up to the camp. Within the schist formation is a pyritized schist-belt about 60 feet in width. Within the pyritized belt, on each wall and about the centre, are smaller belts, or veins, about 6 feet wide, representing probably later shears or, at any rate, more intense shearing, in which there has been a concentration of minerals, mainly marcasite or white iron pyrites. The belt has been exposed across its full width by open-cuts, which, however, do not expose any important indications of copper as had been represented. Without sampling, I judge the whole would average not over 0.25 per cent. copper.

About 25 feet vertically below the surface cuts a tunnel has been driven 50 feet in the central vein of the big belt and a crosscut driven from the face of the tunnel north to the hanging-wall vein and through it. No ore was found in this working, nor could any be really expected from the appearance of the surface showings directly above.

About 300 feet south of this big belt a few shots have been put in along the face of the bluffs, but I could not find anything except pyritized schist. There is very little encouragement for further exploratory work.

## ALBERNI MINING DIVISION.

This Division was for some time the important mining centre of the island. The Alberni canal cuts almost through the island, providing a perfect cross-section of the different rock formations comprising Vancouver island at that point.

Many claims were staked along the canal from twenty to thirty years ago and a large amount of work done on them, resulting in the majority obtaining Crown grants, from which they have never recovered. The owners are content to pay the small tax on them rather than attempt development-work. Out of the great number of un-Crown-granted claims staked there are but a few kept in good standing by annual assessment, the greater number being held by restaking.

Several properties were developed to the shipping stage, but ultimately closed down, whether from lack of ore or lack of profitable values I do not know. Little has been done for the past ten or fifteen years and consequently many of the old trails and roads over which ore was hauled have become overgrown and useless. I expect to examine most of these old properties next spring with the hope of finding some with sufficient tonnage of ore that modern milling practice may make profitable.

It is possible that something may be done during 1928 to demonstrate the worth of the coal indications in the vicinity of Port Alberni.

### Alberni Canal Section.

**Grizzly.** This claim is owned by E. Laubert, of Port Alberni, and is situated on China creek, about 9 miles from the port. It is reached by way of a fair truck-road 6 miles to the city waterworks intake. Thence a good foot-trail leads to the showing on a small branch of China creek at 1,300 feet elevation. The showing occurs in a belt of argillite striking S. 60° W. and dipping almost vertically, conforming with the strike and dip of the slates. The mineralization consists of disseminated arsenopyrite, with bands and nodules of native arsenic, contained in a calcite gangue. This occurrence is very similar to that at the *Engineer*, Atlin; it is possibly the only other place in the Province where native arsenic is found. The *Engineer* arsenic carries very high values in gold, differing in this respect from that of the *Grizzly*, which assayed only a trace. The calcite has a width up to 2 feet, and with parallel stringers along each side makes the vein-width up to 4 feet in places.

The work done consists of a drift-tunnel 50 feet long in the west bank of the creek, which shows the calcite vein all the way, but the mineralization extends only a short distance. A shaft probably 20 feet deep has been sunk on the vein on the west side of the creek-bed, producing several tons of good ore. The vein shows a width of about 2 feet to a depth of 15 feet, as far as can be seen on account of water. The ore-shoot exposed in the creek-bed and tunnel is about 30 feet long. No work has been done on the north bank of the creek, which is heavily overburdened, but a good depth could be obtained by starting a drift a distance of 75 to 100 feet back from the bank.

A sample across 14 inches of mineralized calcite, just east of the collar of the shaft, assayed: Gold, trace; silver, trace; arsenic, 4.7 per cent.

**Thistle.** This group consists of four claims owned by A. Watson, of Port Alberni, and others. The claims are situated about 10 miles east of Alberni canal from a point 12 miles down from Port Alberni. Considerable development-work was done on these claims twenty-five or thirty years ago, when a good road was graded for about 6 miles from the beach. This is now thickly grown over with young willows and evergreens and almost impassable. The old trail from the end of the wagon-road to the claims is still in fair condition.

There were two or three good-sized log camp buildings at the camp at one time, but they are now dilapidated and overgrown with willows. The only cabin left is an old one at 6-Mile, the end of the wagon-road grade. I made the trip in two days, stopping at the 6-Mile cabin the first night and going into the property and back to the beach the next day; but one should figure on at least three days owing to the condition of the old road which must be followed.

The country-rock in the vicinity of the showings is volcanic, in which are shear-zones which have been mineralized with pyrite and chalcopyrite. At 2,600 feet elevation a tunnel was started on the hanging-wall of a chalcopyrite-cropping and driven 25 feet across it, showing a very fine body of copper ore all the way, striking N. 60° W. (mag.) and dipping 57° to the south-west. A drift of 20 feet along the foot-wall from the crosscut tunnel shows an increasing percentage of iron. Another short tunnel about 20 feet below this shows only about a foot of ore, on which a raise was put up to the 2,600-foot tunnel. Above the 2,600-foot tunnel-level there is a fine outcropping of chalcopyrite ore. Two tunnels were driven and considerable surface work done above what

I consider the vein-cropping. One tunnel at 2,700 feet elevation was driven into the hill for a distance of over 100 feet, with a crosscut of 50 feet about 30 feet back from the face. Another tunnel on the same level and about 30 feet to the east was driven on a bearing of about 30° away from the first tunnel. No ore was found in any of this work. Some patches of ore can be seen on the surface 25 feet above the upper tunnel and 50 feet farther up a shallow shaft shows a foot of chalcopyrite at the collar, but which pinches out in a few feet.

The hill pitches at 52° and the vein 57°. The patches of ore found on the side of the hill above the tunnels are the remains of the vein which has been eroded, leaving these spots of ore in the hollow places on the foot-wall. The upper tunnels are therefore in the foot-wall, with no chance of finding any ore. Development-work should of course be done anywhere below the croppings.

**W.W.W.** This group consists of four Crown-granted mineral claims, situated 12 miles up Franklin river, which flows into the east side of Alberni canal 12 miles from Port Alberni. This group is one of the very old locations of this section. From the description of the property in the 1921 Minister of Mines' Report I conclude that it may have merit and importance.

From this report the country-rock consists of altered volcanics, andesite, etc., termed the "Vancouver volcanics." Within a shear-zone in the formation is a quartz-filled fissure, mineralized with pyrite carrying good gold values and also some free gold. Two tunnels have been driven, the upper one 72 feet and the lower 117 feet on the vein, and a winze sunk from the lower tunnel. The upper tunnel shows the vein for the whole distance, of which the first 30 feet is described as an ore-shoot; the balance is quartz, apparently low grade, up to the face, where the vein is about 6 inches wide, assaying 5 oz. gold to the ton. Samples of the decomposed quartz can be had carrying very high gold values due to the residual gold. Some stoping was done above the lower tunnel at a point about 60 feet in from the portal.

**Dauntless.** There are four claims in this group—*Dauntless Nos. 1* and *2*, *Evelyn Lewis*, and *Cora*—two of which are located along the beach and the other two adjoining them up the hill. The claims are situated on the west side of Alberni canal, about 4 miles down from Port Alberni, and are owned by Isaac C. Lewis, of Vancouver. The general rock formation is the "Vancouver volcanics." There are two series of shear-zones, the south one extending from the beach at S. 50° W. (mag.) and dipping 60° east; the other, 200 feet higher up the hill, strikes north-south (mag.) and stands almost perpendicularly. The S. 50° W. series consist of small seams of ground-up material showing very little mineralization. On the south of this series two short tunnels about 15 feet apart have been driven on the same zone. Except for a small bunch of chalcopyrite near the collar of the south tunnel, these are apparently only mud-seams. About 200 feet north another parallel shear has been driven on for 50 feet from the water's edge, showing only small bunches of chalcopyrite. Another tunnel on this same shear 150 feet higher up has been driven 100 feet, showing similar conditions.

The upper or north-south zone has been drifted on in an open-cut and short tunnel, showing a fairly well pyritized quartz vein about 6 feet wide. In the open-cut at the mouth of the tunnel there is a showing of solid pyrrhotite and chalcopyrite about 2 feet wide, on which a shaft has been sunk 27 feet. This was full of water, but the owner claims there is good ore all the way to the bottom. This, in my opinion, is the best and most encouraging showing on the property, as it has a greater width of quartz, well mineralized with both pyrrhotite and chalcopyrite, than any of the other exposures. I therefore advised starting a tunnel on this shear low enough to drive under the shaft and see what that ore-shoot amounts to.

**Mercury Mines, Ltd.** This company was incorporated in October, 1927, with a capitalization of $10,000, divided into shares of $1 each, with its registered office in Victoria. The company acquired from J. E. Boss the old Crown-granted mineral claim *Sechart*, to which has been added two more by staking, the *Sechart No. 2* and *Sechart No. 3*. They are situated about half a mile from the beach, a short distance east of the Sechart Whaling Station on Barkley sound. Some work was done about twenty-five years ago, consisting of three short tunnels and a shaft about 40 feet deep. This work shows a width of altered limestone in which are small veinlets of cinnabar across a width of 35 to 40 feet. It is claimed that this and the Kamloops showings are the only showings of cinnabar, not only in the Province, but in the British Empire, the main world supply coming principally from Spain and Italy.

The deposit at Sechart was examined by V. Dolmage and described in the Summary Report of the Geological Survey of Canada, 1919, Part B. A sample taken by him off the old dump from the shaft assayed 38 per cent. mercury, which was, of course, too low grade to work at that time. The present price of mercury in Canada is about $1.25 a pound, giving a value of $9.50 a ton to the old dump. Mr. Boss has interested sufficient capital to more thoroughly explore the deposit and will, if development warrants, install a plant at the mine for the production of mercury.

Other properties contiguous to Alberni canal and Barkley sound and the year of the Annual Report in which they have been reported on are as follows: *Bank*, 1917; *Canadian*, 1916, 1917, 1918; *Victoria*, 1917; *Three Jays*, 1916, 1918; *Edith*, 1916; *Monitor*, 1916, 1917, 1918; *Happy John*, 1916, 1918; *Torse*, 1916; *Marble Cove*, 1917, 1918; *Sunshine*, 1918; *Kitchener*, 1916; *Sudbury Pacific*, 1917.

### Sproat and Great Central Lakes Section.

**Morning.**

There are three claims in this group—*Morning*, *Morning No. 1*, and *Apex*—owned by A. L. Smith, of Alberni, and associates. The property is situated 4 miles up Taylor river from the head of Sproat lake and is reached thus: By auto from Alberni to the foot of the lake, where a launch can be had to the head of the lake; thence by good foot-trail up Taylor river to the property. Recommendation will be made for the continuation of this trail over the divide to meet a trail up Kennedy river from Kennedy lake. This will make a useful through trail from coast to coast.

The prevailing rock formation is altered andesite of the Vancouver volcanics. The veins, of which there are two, consist of quartz-filled fissures striking N. 60° E. (mag.) into the hill and dipping about 85° to the west. The quartz is mineralized with pyrite, chalcopyrite, and pyrrhotite, carrying appreciable gold and silver values.

The main working is a tunnel at 500 feet elevation (350 feet above Sproat lake), driven 345 feet. The first 100 feet is not on the main vein, but follows a cross-slip in which there is a little mineralization. From the 100-foot point to the face the drivage is on the vein, showing it to vary from 1 to 5 feet in width and to be intensely oxidized throughout. The gold values vary from $2 to $15 to the ton. At 600 feet elevation, or 100 feet above the tunnel, the vein has been open-cut, showing a width of 5 feet and also showing that there is a much greater proportion of sulphides than in the tunnel below, the face of which is apparently beyond this point on the surface. At 875 feet elevation is another open-cut on the vein, which is 2 feet in width at the bottom of the cut of very good-looking ore. This would be a favourable location at which to start another drift on the vein. Further work has been done in tracing the vein up the hill on the *Apex* to an elevation of 4,500 feet, but owing to limited time the higher work was not examined. The owner claims better showings on the higher ground.

Some 200 feet to the west of this vein another similar one has been discovered and opened up by an open-cut and short tunnel. It strikes slightly away from the first vein, going up the hill. The ore is identical with the other vein and I was informed that gold values up to $40 to the ton have been obtained from the heavy iron sulphides.

A sample of 25 lb. of the ore was shipped to the Ore Dressing and Metallurgical Laboratories of the Department of Mines, Ottawa, for experimental purposes. The sample assayed: Gold, 0.34 oz. to the ton; silver, 1.06 oz. to the ton; copper, 1.22 per cent.; insoluble, 76.5 per cent.; iron, 8.7 per cent.; sulphur, 9.6 per cent.; which I would judge a typical sample of the ore. The Department made five tests consisting of selective and straight flotation; and the same followed by tabling; and an amalgamation test to prove that a very small percentage of the gold is free-milling. It was shown that the gold values are associated with both the iron and copper sulphides and therefore selective flotation was of no benefit. Straight flotation gave a recovery of 98.7 per cent. of the copper and 89.7 per cent. of the gold and made a concentrate assaying 4.6 per cent. copper and 1.12 oz. gold to the ton, with a concentration ratio of about 4 into 1. Tabling after flotation would slightly increase the gold recovery.

I have been informed by the owners that this property has been bonded and work will be started early next season.

## CLAYOQUOT MINING DIVISION.

This Division extends from the north side of Barkley sound to the northern side of Esperanza inlet, about 100 miles along the west coast of Vancouver island, the many inlets furnishing hundreds of miles of inland waters for small boats.

Some years ago there was a great deal of prospecting done in this Division around the many inlets which make the country exceptionally accessible as far as they go. From the heads of the inlets back into the range little is known, as it will require trails to make this attractive to prospectors.

Many small gold-bearing quartz veins have been at least partially prospected, but apparently without success, in so far as production is concerned. The only property that has been equipped and reached the producing stage was the *Indian Chief* on Sidney inlet, a low-grade copper property operated at the time by the Tidewater Copper Company, but idle since 1923 and now dismantled.

### Kennedy Lake and River Section.

This is an interesting-looking section for the reason that the rock formation and ore occurrences are different from the basic Vancouver volcanics, which is the predominating rock formation on the island. This section contains a lighter-coloured rock, more siliceous, and porphyritic in appearance, in which occur fissures filled with gold-bearing pyritized quartz veins. Several of these veins were sufficiently attractive many years ago to warrant the installation of small plants, but apparently the gold values were not continuous enough to support operations.

The *Leora*, a mile up Kennedy river from Kennedy lake, and the *Rose Marie*, 3 miles up, were both worked in 1900, but abandoned after a year or two of operating. Since then there has been little or no prospecting in any of this area and consequently only a small portion of the section has received any attention.

V. Dolmage, of the Geological Survey of Canada, is of the opinion that the gold in the Wreck Bay placers had its origin in these small quartz veins.

I think the higher ground, farther up Kennedy river, would well repay prospecting and it should therefore be made accessible by the continuation of the trail up Kennedy river and through to the Taylor river, which empties into Sproat lake. (*See also* Sproat Lake section.)

The Sutton Lumber Company, owning extensive timber tracts in this section, has been running a reconnaissance survey round Kennedy lake to ascertain the feasibility of raising the lake-level about 100 feet for logging purposes. This would back the lake up Kennedy river for a distance of between 4 and 5 miles.

The section is now reached by launch from Tofino to the Clayoquot cannery, then up the rapids at the mouth of Kennedy river for about 500 yards. This channel has been cleared of boulders and is not difficult to navigate. From there up Kennedy river to the lake is about 3 miles, to the head of the lake is another 12 miles, and a small boat can be taken about 3 miles up Kennedy river to the rapids, altogether a very pleasant trip of a few hours in a boat with a kicker.

**Jo Jo.** There are two mineral claims in this group—the *Jo Jo* and *Jo Jo No. 1*—owned by W. Spittal, of Tofino, and W. S. Dixon. The claims are situated less than a mile above the old *Rose Marie* camp on the east side of Kennedy river, or about 3½ miles from Kennedy lake. The formation consists of belts of volcanics and sedimentaries. At 575 feet elevation several open-cuts have disclosed a quartz vein striking N. 40° E. (mag.) and dipping slightly to the west with the slope of the hill. The quartz is well mineralized with pyrrhotite, pyrite, and some sphalerite and chalcopyrite, with here and there a trace of galena. The vein, which is about 2 feet wide, is well defined and has been traced on the surface for several hundred feet and altogether has a very favourable appearance. The chalcopyrite appears to be associated with the pyrrhotite and sphalerite and the galena with the pyrite; the whole when concentrated would probably be 8 into 1. A sample across the best-looking ore was, however, very disappointing, giving no gold or silver values and only small percentages of zinc and copper.

**Rose Marie.** There are four claims in this group, now owned by A. Watson and associates, of Port Alberni, and situated on the east side of Kennedy river, about 3 miles up from its mouth. This property was operated in 1899, when a 4-stamp mill, boiler, tables, and compressor were installed and, I understand, worked for a couple of seasons.

Ore for the mill was obtained by trenching along the vein-croppings about 1,000 feet above and sent down by aerial tramway. Later a tunnel was driven 350 feet on the vein 400 feet below the croppings, but, though the vein is very well defined and maintains its width throughout, the values were apparently unsatisfactory. I took a sample across 18 inches of slightly mineralized quartz in the face of the tunnel, which assayed: Gold, $1.60 to the ton; silver, 1 oz. to the ton. There are evidences that the tunnel has been thoroughly sampled.

The veins in this section are so uniform in width and continuity that average values of $12 to $15 to the ton would make profitable small properties.

**Gold Queen, Gold King, and Golden Glow.**

These claims, owned by W. Spittal, of Tofino, are situated about 6½ miles up Kennedy river on its west side. There is a cabin on the claims a short distance from the river, but it has been badly damaged by a falling tree. It is at the 140-foot contour, which shows the slight grade up the Kennedy river in that distance. The general rock formation is a fine-grained, schistose greenstone, indicating a broad shear-zone in the volcanic rocks. Conforming with the strike of the schists is a quartz vein varying in width up to 10 feet in places, but averaging probably between 2 and 3 feet. This vein is mineralized in spots. It has been traced for over 1,000 feet from the first cropping on the top of a knoll on the left side of a trail at 450 feet elevation. The vein crops going north along the bed and sides of a creek which crosses it just beyond the first cropping. The surface exposures show little mineralization except in one place on the east side of the creek, but here the vein has pinched down to seams of iron sulphides, from which the owner claims to have had assays of $50 to the ton in gold. Farther up the creek on the north side the vein stands up perpendicularly and is apparently about 10 feet wide and a little work done here might show up to advantage. The vein here strikes east-west.

The vein should be exposed south of the first cropping and drifted on a short distance, and if any encouragement is obtained a greater depth could then be had by crosscutting from the creek below the falls. A crosscut of 100 feet would gain approximately 200 feet depth under the lowest cropping. A serviceable water-power could be developed from the falls.

The vein shows continuity, a little mineralization and values in places, and is therefore probably worth some surface exploration in the hope of finding ore indications worth development.

Other properties in this section which I have not examined, but which may be of interest to the reader, and references to Annual Reports are as follows: *Wonder*, 1918, 1921, 1923; *O.K.*, 1918; *Northern Crown*, 1918; *Grant*, 1923.

### Tofino Section.

**Walton's Claims (White).**

This property, formerly *White* group, is now owned by W. Walton, of Tofino. There are four claims in the group—*Alpha*, *Norman*, *Omeaga*, and *Douglas*—situated 2 miles up Tofino creek, which empties into tide-water at the head of Tofino inlet. There is a fair foot-trail from the beach to the cabin at 675 feet elevation. The showings are above the cabin at an elevation of 825 feet. The general country-rock is the Vancouver volcanics, within which is a belt, apparently about 50 feet wide, of metamorphosed rocks, containing mainly garnetite and epidote. This contact-belt strikes east-west (mag.), dips slightly north, and is mineralized with disseminated and bunches of chalcopyrite. Just above the cabin the vein, or belt, is eroded to form a narrow canyon, at the head of which the only ore in place is found. A short tunnel a little lower down at 800 feet elevation in the hanging-wall of the bluff shows no mineral, and another at the foot of the canyon into the hanging-wall country-rock has likewise exposed no mineral. Both these tunnels are useless pieces of work.

The interesting feature of the property is the quantity and quality of the float-ore found in the rock-slide which has accumulated at the foot of the canyon. Some 500 sacks of chalcopyrite that will assay well over 10 per cent. copper has been sorted out and stored in a small building at the cabin. Judging from the size of some of the boulders of solid ore, the vein must have been several feet in width.

There are small patches of ore in the face of the canyon, but nothing to suggest the amount of ore showing in the slide. In fact, if it were not for the float-ore the property would not be at all attractive. The ore-shoot may have been at the foot of the canyon, but that would be hard to explore because of the accumulation of slide-rock. The property is well worth very close prospecting.

There are three old properties in this section—*Crow* (1916 Annual Report), *Jumbo* (1916), and *Bounce* (1916)—to which the reader is referred.

### Bedwell Sound Section.

I did not have time this year to examine any claims in this section and therefore can only refer you to properties described in former reports.

**Ptarmigan.** (*See* Annual Reports for 1914 and 1926.) The claims are situated on the westerly side of Big Interior mountain between Great Central lake and Clayoquot sound. They are owned by the Ptarmigan Mines Company, of London, England, which had undertaken extensive work on the property in 1914, when the war broke out, since when nothing has been done. Information is rather meagre, but evidently the mineralization consists of magnetite and chalcopyrite occurring in a contact-metamorphic zone between diorite and limestone. Reports would seem to indicate that there are sufficient showings of copper to justify extensive development.

**Empress.** (*See* 1918 Annual Report.) This claim is situated 4 miles up Bedwell river from the head of Bedwell sound. The report states that the metallic mineral is chalcopyrite occurring in a shear-zone in granodiorite, apparently about 25 feet wide. The conclusion expressed is that the showings are well worth exploration. This statement might warrant an examination of the property.

**You.** (*See* 1921 Annual Report, from which the following is excerpted.) A group of four claims situated at 3,000 feet elevation on the westerly slope of the Beaufort range of mountains, between Great Central lake and the Coast. It is reached by way of Tofino, a port of call for Coast-plying boats every ten days; thence by launch to the head of Bedwell sound, from which it is 3 miles to the claims. The ore-showing is described as a fissure in a shear-zone in the Vancouver volcanics, filled with quartz, breccia, and gouge, the quartz being from 6 to 9 inches wide in a 3-foot fissure. The quartz is mineralized with pyrite, galena, zinc-blende, and grey copper, carrying gold values sometimes in native form. A tunnel 78 feet long has been driven on the vein, obtaining great depth as the bluffs above are very steep. Assays indicated an ore-shoot, for 40 feet or more in the tunnel from the mouth, of about 8 inches in width, assaying from $17 to $70 in gold. In the face there are 4 inches of quartz carrying little values. At the time this report was made the property was owned by J. B. Woodworth, of Vancouver.

The only other properties in this section are the *Big Interior* and *Della* groups, on the divide between Great Central and Buttle lakes and reached by way of Great Central lake and the trail up Drinkwater creek. I have not examined this area, but refer the reader to the 1916 Annual Report.

### Sidney Inlet Section.

*Tidewater Copper Co.*—Previous to 1923 the Tidewater Copper Company operated the *Indian Chief* on Sidney inlet. Information regarding the property may be obtained from the 1920, 1922, and 1923 Annual Reports. The assets of the company were sold in 1925 to satisfy the creditors. The management of the company was obviously a case of "not wisely but too much."

### Hesquiat Lake Section.

*Hesquiat.*—The only group of note in this section is the *Hesquiat* group of four claims, staked a couple of years ago by A. L. Smith, of Alberni, and associates. Samples of ore show good values in gold, silver, copper, and zinc.

### Muchalat Arm Section.

*Shannon.*—Though I have not examined this section, I judge from former reports that there has been a very considerable amount of prospecting done. A sample submitted me from the *Shannon*, owned by A. Parks, of Nootka, gave assay returns of: Silver, 15.6 oz. to the ton; copper, 10 per cent.; lead, 8 per cent.; zinc, 13 per cent.

### Tasis Canal Section.

*Star of the West.*—The *Star of the West* group, owned by Wm. Poole, of Nootka, and situated at the head of Tasis canal, has been favourably described in previous Annual Reports. I have not examined this section and therefore refer you to the 1925 Annual Report.

## QUATSINO MINING DIVISION.

This Division occupies the north-western portion of Vancouver island and is reached either by the west coast boats running every ten days from Victoria to Port Alice on the South arm of Quatsino sound, or by way of Port Hardy on the east coast, from which point there is an auto-road across the island to Coal Harbour on the West arm of Quatsino sound.

This Division bids fair to come into prominence through the operations of the Coast Copper Company now developing the *Old Sport* and other groups in the Elk Lake country. That prospecting has been active this year is evidenced in seventy-eight claims being recorded.

### Quatsino Sound, West Arm Section.

**Millington.** This group of six mineral claims—*Millington, Cracker Jack, Hood, Molly B., Paystreak,* and *Molly Bawn*—is situated 3½ miles up the valley from Holberg at the head of the West arm. The owners are Spooner Bros., of Holberg, and associates. The property has been thoroughly described in the 1926 Annual Report and I will therefore confine myself to this season's findings and exploratory work.

The general rock formation is basalt, in which occurs a belt up to 30 feet wide, within which are small veinlets and lenses of bornite also disseminated throughout the rock. The more concentrated mineralization is generally confined to a width of about 10 feet. So far no ore has been exposed in the older workings in sufficient quantity to be hand-sorted and shipped at a profit. Diamond-drilling would doubtless be the best method of prospecting this belt for a tonnage of milling-grade ore.

Early this spring another discovery of bornite about 500 feet west of the original showings, on an east-west vein, was made. This vein has been open-cut and stripped along the face of a steep mountain-side for 150 feet or more, showing the mineralization to be from 2 to 5 feet wide, carrying small lenticular masses and small veinlets of bornite. Assistance was granted, on recommendation, by the Department of Mines for a trail to this ore-exposure from the main trail. It was the intention of the owners to do considerable work on the vein this summer and if feasible sort out the bornite for shipment. Altogether I think the property has considerable prospective merit as a proposition to be developed by a large company with the object of proving a sufficient tonnage of milling-ore to warrant a concentrator.

Since the above was written I have received word from the owners to the effect that the Consolidated Mining and Smelting Company has taken an option on the property and is installing a diamond-drill outfit on the old showings.

### Quatsino Sound, South-east Arm Section.

**Sunrise.** This group of two claims, the *Sunrise* and *Sunset*, owned by Messrs. Clancy and Kinsey, of Quatsino, is situated near the beach between Jeune Landing and Port Alice. The owners have done only assessment-work on these claims, as all their efforts have been concentrated on the *Alice Lake* group.

**Alice Lake.** There are seven claims in the group—*Alice Lake, Galena, Paystreak, Lucky Strike, Cedar, Hornet,* and *Iron Knob*—the last mentioned being an adjoining Crown-granted claim acquired by purchase. The owners are Wm. Clancy and W. D. Kinsey, of Quatsino, Mr. Clancy living on the property and supervising its development. The showings are situated at an elevation of about 1,000 feet, being about 700 feet above the Coast Copper Company's road about half a mile distant, from which point it is about 4 miles to Jeune Landing on the South-east arm, a port of call for the Coast steamers. Transportation therefore presents no difficulties.

The mineralization consists of galena, zinc-blende, and pyrite, occurring as a replacement in crystalline limestone. The limestone-belt is from 3 to 4 miles in width, extending across to the South-east arm of Quatsino sound and contains many intrusions of diorite and small post-mineral dykes which strike in all directions, dip from flat to vertical, and apparently do not affect the vein or mineralization in any way.

The owners are certainly deserving of credit for the amount of exploratory work done. Four open-cuts have been put in along a distance of 150 feet, indicating a strike of N. 5° W. (mag.) and exposing ore of a width up to 20 inches, assaying: Lead, 10 per cent.; zinc, 14 per cent.; silver, 7 oz. to the ton; gold, from $10 to $20 to the ton. A crosscut tunnel driven a short distance beneath this surface showing shows no signs of mineralization. Two shallow shafts sunk on the ore go through it in a few feet, and open-cuts on either end show that it has no continuity either way on its strike.

However, Wm. Clancy is exploring along the lines of a property in Mexico described by Prescott in an article in the *Engineering and Mining Journal*, I think early in 1927. This is

described as being a pipe or chimney of ore forced up from below in a molten state, following the lines of least resistance along the joints in the limestone and eventually reaching the surface.

The tapering of the ore-shoot on this property to nothing on the ends lends itself to such a theory. Also on an adjoining claim there is a showing of ore from 30 to 40 feet, roughly square, on the surface, having no extensions or offshoots in any direction and which could be an ore-chimney in accordance with the theory mentioned. The exploration-work will therefore consist of following the ore wherever it goes.

**Coast Copper Co., Ltd. (Old Sport).** This company was incorporated in September, 1916, with a capitalization of $1,000,000, divided into 200,000 shares of $5 each, with its head office at Trail. The holdings of the company consist of a number of groups of mineral claims, including the *Old Sport* group, in the Elk Lake area. The main workings are on the *Old Sport* group, but extensive prospecting has been done throughout the area by the company, resulting in the acquisition of a great area of mineral-bearing ground. The property has been described thoroughly in previous reports (*see* 1924 Annual Report), and the geological conditions were given by Victor Dolmage in the Summary Report of the Geological Survey of Canada for 1918, and to these the reader is referred for details.

Ore-bodies are contained in a contact-metamorphic belt up to 80 feet wide between diorite and crystalline limestone. The mineralization occurs as disseminated sulphides of iron and copper, as well as in bands of fairly pure chalcopyrite up to 3 feet in thickness. The gold values are low but persistent.

Over 3 miles of underground work has been done on five levels, the fifth, seventh, and eighth, all of which are opened from the surface, and the ten and twelve opened by sinking from No. 8. The lowest surface level, the No. 8, has a 2,000-foot crosscut through the diorite country-rock to the contact-belt, along which nearly a mile of drifting has been done, exposing three important ore-bodies on this level. This level is at 450 feet elevation. The lowest or No. 12 level is about 400 feet down the shaft or 50 feet elevation. The Nos. 10 and 12 levels have been opened up this year. On the No. 10 there has been 1,250 feet of drifting, 287 feet of crosscutting, 21 feet of raising, and 10 feet of sinking. On the No. 12, 970 feet of drifting, 197 feet of crosscutting, and 30 feet of raising. The year's underground work for the mine totals over 3,100 feet, besides 640 feet of diamond-drilling. No information is available at the present time as to the results of the work on the Nos. 10 and 12 levels.

Transportation and freight-handling facilities have been greatly improved this year. A new dock was built by the Government at Jeune Landing and corduroy roads for truck-haulage completed from Jeune Landing to Alice lake and between Alice lake and Kathleen lake, making a continuous service by trucks and boats on the lakes from tide-water to the mine. A new cook-house and two houses were constructed. An average of twenty-nine men underground and twenty on the surface was employed throughout the year. There seems to be every reason to believe that this property will justify the construction of a concentrator for the treatment of this profitable low-grade copper ore and a railway from the mine to tide-water in the near future. Furthermore, the ore possibilities of the adjacent ground are such that the whole area may develop into a mining enterprise of great importance. All operations at the mine are under the able supervision of C. A. Seaton.

## NANAIMO MINING DIVISION.

This probably is the most diversified mining area in the Province, since it includes the western flank of the Coast range on the Mainland; all the Gulf islands; and the southern portion of Vancouver island, comprising about one-third of its total area; each portion representing different geological conditions for the deposition of ore-bodies.

The mining industry includes metalliferous mining, coal-mining, and the production of non-metallics and building materials. While there is a comparatively small output of the metallic minerals, the potentialities of the Division may be judged from the fact that there are about 435 mineral claims in good standing, of which 125 were staked in 1927.

There could not be more ideal conditions for prospecting and mine-operating, such as climate, transportation, water-power, and timber, than obtain in this Division.

*Nanaimo Pressed Brick and Tile Co., Ltd.*—This company has recently been incorporated with a capitalization of $250,000, divided into 25,000 shares of $10 each, with its registered office

in the Herald Block, Nanaimo. The holdings consist of 95 acres of shale lands at East Wellington, about 4 miles from Nanaimo, on the railway owned by the Nanaimo Lumber Company, Limited. Bricks made from this shale some years ago by a former company were of exceptionally good quality, as evidenced by such buildings as the Bank of Commerce, Nanaimo; Post-office, Duncan; Normal School, Presbyterian Church, and other buildings in Victoria; and several school buildings in Vancouver. It is the intention of the company to install an up-to-date brick- and tile-making plant.

### Nanaimo River Section.

**Silver Leaf.**

There are three claims in this group—*Silver Leaf*, *Mountain Ash*, and *Hemlock Fraction*—situated on the divide between the heads of the Chemainus and Nanaimo rivers. The owners are E. F. Miller and associates, of Duncan, forming the Silver Leaf Syndicate. The ore-showings and workings on the property are on the Nanaimo River slope at an elevation of about 2,300 feet, at the head of Jump creek, a south branch of Nanaimo river. The most accessible route at present is by way of the trail up Cottonwood creek from Cowichan lake, a distance of about 10 miles. For ore-shipping both routes would have to be investigated for the more feasible one, whether over the summit, which is over 4,000 feet elevation, and down Cottonwood creek to the Canadian National Railway on Cowichan lake, a straight distance of approximately 5 miles; or down Jump creek and the Nanaimo river to the coast, a distance of 18 miles.

The general rock formation is andesite of the Vancouver volcanics, in which occur on these claims three shear-zones striking S. 60° W. (mag.) into the hill and dipping between 75° and 80° to the east. Some surface work has been done on two of these zones by way of open-cutting and stripping, tracing them for a considerable distance up the hill. On the south zone, at about 400 feet above the cabin, a tunnel has been driven 70 feet, with a crosscut of 10 feet into the hanging-wall about 10 feet back from the face, under an outcropping of good-looking copper ore exposed for about 70 feet in length, with a width of 30 inches. This tunnel shows the vein to be continuous to the face, where it is about 3 feet wide, though showing little mineralization at this point. The tunnel starts in a shoot of good ore about 2 feet wide composed of quartz and calcite, well mineralized with pyrrhotite, arsenopyrite, and chalcopyrite, assaying: Gold, $10 to the ton; silver, 1.5 oz. to the ton; copper, 9 per cent. At 50 feet in the tunnel a lens of solid sulphides, pyrrhotite, and chalcopyrite, about 20 feet long, or nearly to the face, and up to 16 inches wide, has been left standing on the hanging-wall side of the vein. An examining engineer's sample of this assayed: Gold, $15 to the ton; copper, 9 per cent.; while a piece of the pure chalcopyrite assayed: Gold, $1.20 to the ton; copper, 17.5 per cent. A short crosscut shows a seam of oxides on the hanging-wall of the shear, and while the face of the tunnel shows about 3 feet of slighly mineralized vein-matter, it warrants driving ahead and widening to the left to cut into the hanging-wall seam with the expectation of encountering more lenses of ore.

About 200 feet north of this zone is another shear about 10 feet wide, showing about 2 feet of oxidized material on the foot-wall side. The balance of the zone is a fine-grained, dark-coloured argillaceous rock in which are veinlets of sparsely mineralized calcite. Lumps of sulphides are found in the oxidized portion; a few pieces of arsenopyrite from here assayed $28 to the ton in gold. I learned later that this north zone had been open-cut higher up the hill and looks very promising. I considered it well worth driving a tunnel at the point I saw it.

There is another wide zone on the *Mountain Ash* showing some mineral, but very little has been done on it.

Though in the Esquimalt & Nanaimo Railway belt, this property was staked prior to the land-grant and therefore holds all surface and mineral rights. Altogether the property has very attractive possibilities, with transportation the main handicap.

### Cameron Lake Section.

**Arrowsmith.**

The only property examined this year in this section was the *Arrowsmith* group, which is comprised of two claims, the *Arrowsmith* and *Outlook*, situated above the lower end of Cameron lake, about 1½ miles from Chalet Station. There is a good foot-trail from the highway. The claims were staked by M. L. Douglas, of Duncan, and are now owned by a Duncan syndicate of E. F. Miller and associates. The

prevailing rock formation is andesitic volcanic rock of the Vancouver group, the mineralizations characteristically occurring in veins or replacements in shear-zones.

This is a very old location on which there is little evidence of much surface work ever having been done to justify the driving of a 350-foot tunnel at 1,490 feet elevation. More recent work consists of a tunnel at 1,575 feet elevation and some surface-stripping. The first showing going up the hill is about 100 yards below the tunnel. Here are several small oxidized stringers in the country-rock striking S. 30° W. (mag.), showing a little chalcopyrite, but of no importance, other than indicating a shear in the andesite. The tunnel above in the bed of a small creek was driven 100 feet, encountering mineralization on a well-defined east-west fault which apparently throws the vein to the left. The tunnel was driven straight ahead and picked up the vein again about 40 feet below the fault, and was then driven on the vein-seam for some distance unknown, as the tunnel was blocked with muck. Later a crosscut was driven west on the south side of the fault and picked up the vein in about 8 feet, showing about 2 feet of vein-matter carrying some chalcopyrite. The vein was then drifted on for about 40 feet to where it intersected the old tunnel. Also a winze was sunk in the old tunnel just on the south side of the fault to a depth of 20 feet, showing a broken-up section slightly mineralized. A crosscut was started from the bottom of the shaft to pick up the vein which had been thrown over by the fault. All this work shows a little mineralization adjacent to the fault, but dying out completely within 40 feet of it. The first 100 feet of the tunnel evidently lies to the east of the portion of the vein north of the fault. I could not recommend any further work on this vein.

Above the tunnel there is a belt apparently 15 to 20 feet wide of more or less altered limestone, striking S. 50° W. (mag.), showing some chalcopyrite in places. Not enough work has been done on it to expose it sufficiently to venture an opinion on it, but I would suggest that a couple of trenches 3 or 4 feet deep be cut across this belt, say 50 feet apart, to make sure that no possibilities are being overlooked.

### Buttle Lake Section.

This section includes the Strathcona Park area and is reached by way of Campbell river, from which there is a good motor-road to Forbes Landing at the foot of Campbell lake, a distance of 12 miles. From Forbes Landing to the Sutherland Bros. camp on Upper Campbell lake is 12 miles of auto-road which is in very poor repair. The Sutherlands have a kicker-driven boat running from their camp to the head of the lake, about 5 miles, and a pack-train from there to the north end or foot of Buttle lake, a distance of about 9 miles, over a fair horse-trail. Saddle-horses are also available. From the foot of Buttle lake one may get a boat with a kicker, by prearrangement with the Sutherlands, to the head of the lake to about 25 miles. Buttle lake is 725 feet elevation. There has been considerable prospecting done around the south end of the lake and a very creditable amount of exploratory work done by the owners, considering transportation difficulties.

At the time of my examination about the middle of June there were three groups of claims in good standing, besides the holdings of the Paramount Mining Company, lying between Myra and Price creeks. Some further staking was done in 1927 on Price creek, which empties in from the south at the head of the lake.

**Paramount Mining Co., Ltd.**

(*See* 1920 Minister of Mines' Report.) This company was registered in the Province in November, 1919. It has a capital of $500,000, with its head office in the Standard Bank Building, Toronto. The Vancouver office is that of Robertson, Douglas & Symes, Bank of Montreal Building, Vancouver. In 1920 the company had acquired some forty claims on Myra creek, on the west side of the head of the lake, which included two groups of claims on the north side of Myra creek under bond, which have since reverted to the owners, leaving the company twenty-four adjoining Crown-granted claims on the south side of Myra creek. The company built trails and camps and did a lot of prospecting and surface work as well as 2,000 feet of diamond-drilling. No information seems to be available as to the results obtained. Nothing had been done since.

**Lynx.**

This is a group of seven claims owned by Cross & Du Bois, of Victoria (St. James Hotel). The claims are situated about 2 miles up on the north side of Myra creek adjoining the holdings of the Paramount Mining Company, Limited, and in the same mineral-belt. The general rock formation throughout this section is volcanic,

with which are associated belts of crystalline limestone. On this and adjoining groups, representing a distance of 4 or 5 miles, the mineralization is in an immense schistose zone in places several hundred feet wide, the result of shear-action in the volcanic country-rock. It has a general strike of N. 80° W. (mag.). The metallic minerals are pyrite, chalcopyrite, galena, and zinc-blende, usually in a siliceous gangue with some calcite and barite. In the shear-zone are widths up to 20 feet or more of soft, thinly laminated sericitized schists, while in other places the rock, though schistose, appears to be more siliceous and harder. The better mineralization appears to favour the harder schists in which are disseminated small crystals of pyrite.

The highest showing, on the *Cougar*, is at 1,650 feet elevation and consists of small veins and bunches of fine-grained galena, zinc-blende, and chalcopyrite across a width of 6 feet. From this point the same zone has been traced across a group adjoining above to the top of the hill. At 1,500 feet elevation the schist has been exposed across a width of over 100 feet, about the centre of which an open-cut penetrates more into the solid formation for a width of 7 feet.

This shows a light-grey rock mineralized with galena and chalcopyrite in small bunches such as was noted in the cut above. A chip sample taken across this gave assays of: Gold, trace; silver, 6 oz. to the ton; copper, *nil;* lead, trace; zinc, 8 per cent. This would be a good vein to drift on and when in 100 feet or more crosscut the whole belt.

About 250 feet east of this belt is a similar one about 40 feet wide, showing the same characteristics of small bunches and lenses of good ore, with small crystals of iron disseminated through the rest of the schists, as in the big zone.

All these ore-exposures in this belt are indicative of extensive mineralization, but because of the loose, porous nature of the schist extensive leaching has taken place near the surface. Some drifting should therefore be done on the more favourable-looking ore-exposures to obtain sufficient depth to get away from surface influence and crosscuts should then be driven across the shear-zone. The owners have accomplished much under adverse conditions, but all the work the prospector could do for several years would make little impression on an area of this magnitude. There is ample water-power and timber for operations of any size.

**Cougar.** Though it is hard to tell from the records, I think this is the name of the group above the *Lynx*. It is owned by J. F. Breeze, of Vancouver, and associates. The group contains the northerly extension of the schist-belt which has been more or less prospected over a distance of 4 miles on the Paramount Mining Company's holdings and the *Lynx*.

**Cross and Du Bois Claims.** These are about fifteen claims, situated about 2½ miles up Price creek, which flows in at the head of Buttle lake, owned by James Cross and Joseph Du Bois, of Victoria (St. James Hotel), and associates. Assistance was granted by the Department of Mines this summer and a trail was built from the cabin at the head of the lake to the main showings, making them fairly accessible. Also some trail-work was done up Myra creek leading to other groups there.

The geological structure consists of great wide belts, up to 1,000 feet in width, of highly altered schists, resulting from shearing action in the volcanics of the Vancouver group, which is the oldest and predominating formation of Vancouver island. These metamorphosed schists vary from greenstone to talcose and sericitic schists, the latter weathering to very soft, thinly laminated material. The schists are disseminated throughout with tiny crystals of pyrite, giving the surface a yellowish to reddish colour. In them are belts up to 30 feet wide which have been more or less silicified, accompanied by calcite and in some places a little barite. These more siliceous belts are mineralized with pyrite, zinc-blende, galena, arsenopyrite, and some chalcopyrite, occurring as small lenses, bunches, and veinlets of solid sulphides. There are three such zones on these claims; the lower one at 900 feet elevation, or 175 feet above the lake-level, has 5 to 6 feet in width of calcite and barite rather heavily pyritized. Farther up the hill at 1,350 feet elevation another belt has been exposed by a few shots in it, indicating a width of from 15 to 20 feet of calcite and barite. The 4 or 5 feet exposed is fairly heavily disseminated with arsenopyrite, sphalerite, and galena disseminated and in small veinlets throughout the gangue. A grab sample was taken of the ore broken out in shooting and gave assays of: Gold, $0.80 to the ton; silver, 4.8 oz. to the ton; copper, trace; lead, 2 per cent.; zinc, 12 per cent. The width of this vein, the solid gangue, and the extent of mineralization makes it a promising showing. A depth of about 30 feet could readily be had for a prospecting-cut across the vein.

The upper showing is at 2,000 feet elevation or 1,300 feet above the lake. Here the creek has cut a canyon 200 feet deep across a schist-belt over 200 feet wide, striking about east-west (mag.) and dipping 70° to the north. There are several bands in this main zone that are worth driving on for a short distance. On the hanging-wall is a 6-foot vein or band of badly decomposed schist heavily impregnated with pyrite and showing a little zinc-blende. A sample across this to ascertain whether milling-grade ore might be expected gave: Gold, trace; silver, 0.2 oz. to the ton; copper, trace; lead, *nil;* zinc, 3 per cent. On the foot-wall of this band a sample of 3 inches of sulphides gave: Gold, $0.40 to the ton; silver, 0.6 oz. to the ton; copper, 3 per cent.; lead, 1 per cent.; zinc, 36 per cent. Some distance from this a sample was taken of a lens of ore in the soft schist as representing the best solid sulphides obtainable. It assayed: Gold, trace; silver, 1 oz. to the ton; copper, 2.5 per cent.; lead, 2.5 per cent.; zinc, 36 per cent. Farther across in this zone, about 25 feet from the hanging-wall, a sample across 3 feet of decomposed schist showing small veinlets of mineral assayed: Gold, trace; silver, 6 oz. to the ton; copper, 1 per cent.; lead, *nil;* zinc, 10 per cent. The balance of the zone had not been shot into at all, but bands similar to those sampled were noted across the whole width.

From the extent of mineralization and the values found in the ribs of sulphides in the highly leached surface material, it would seem reasonable to expect an improvement in at least the extent of mineralization at greater depth. A systematic plan of diamond-drilling would be the only feasible method of obtaining any conclusive data as to the possibilities of these big schist-belts.

The only difficult place in taking in such equipment would be the 9-mile pack from Upper Campbell lake to the end or foot of Buttle lake.

No information is available as to the results of the drilling on the Paramount Mining Company's ground, but the fact that the company has kept a number of claims in good standing for several years would suggest some merit to the property.

### Horne Lake Section.

There is a good auto-road to Horne lake branching from the Island highway.

**P.D.**

This is a group of two claims, *P.D. No. 1* and *P.D. No. 2*, owned by James Palmer and M. L. Douglas, of Duncan, and situated on the easterly slope of Maria mountain, about a mile east of the north end of Horne lake. The claims are at 1,400 feet elevation, or 1,000 feet above the lake, and are reached by a trail branching from the logging-railway which runs along the north shore. The immediate rock formation is crystalline limestone, its contact with the Vancouver volcanics being some distance north of the ore-showings, which lie entirely in the limestone. It is an old property on which considerable work was done some years ago, consisting of surface-trenching and a shaft sunk to a depth of 100 feet in the hanging-wall limestone and a crosscut from the bottom of the shaft across the vein. From this work there is a small tonnage of good zinc ore on the dump.

The vein strikes about north-south (mag.). At the shaft a trench a few feet deep has been run the full width of the vein of 24½ feet, at this point showing a heavy mineralization of arsenopyrite with some zinc-blende. A chip sample was taken across the vein along the bottom of the trench, dividing it into two sections of 14 feet on the foot-wall, which appeared to carry the most zinc, and 10.5 feet on the hanging-wall or shaft side. The 14-foot section assayed: Gold, trace; silver, trace; zinc, 2 per cent. The 10.5-foot section assayed: Gold, trace; silver, trace; zinc, trace.

About 50 feet above this two old open-cuts show the vein to have split up into two or three smaller veins within a total width of about 25 feet. The zinc appeared slightly better in these small veins, but mining conditions would not be as favourable.

About 150 feet below the sampled trench another trench has been put in across the vein by the present owners, showing the vein to be about 18 feet wide, across 8 feet of which the owners claim 20 per cent. zinc. The sides of the trench showed only broken-up and badly oxidized material and the bottom was filled in with the same from the sides, so that I did not have an opportunity of sampling it.

There are probably lenses of good zinc ore in the vein, but as the gold and silver values are negligible only zinc values can be figured on. It would therefore require a good grade of ore and very favourable mining conditions for profitable production. Development of this property

will necessitate sinking and therefore more expensive mining. It will therefore require careful investigation and consideration before undertaking to make a producing property of it.

### Port Hardy Section.

**Caledonia Mines, Ltd.**

One property only is under operation in this section, that of the Caledonia Mines, Limited. This company was incorporated in August, 1926, with a capitalization of $250,000, divided into 2,500 shares of $100 each, with its head office at 403 Pacific Building, Vancouver. Murray C. Potts, Alert Bay, is the secretary-treasurer of the company. Its holdings consist of the three original mineral claims, *Caledonia*, *Cascade*, and *Blue Bell*, to which has been added the *Scotia*, *Maple*, and *Thistle*. They are situated about 1½ miles east of Quatse lake. This year the company, assisted with a grant from the Department of Mines, built 5 miles of road to the property, starting from the 6-Mile post on the Port Hardy–Coal Harbour auto-road. This work occupied the summer season and it was late in the year by the time the 2-drill compressor plant was taken in and installed and mining started. The heavy snow and cold weather conditions necessitated closing down just before Christmas, but work is to be resumed as early as conditions will permit.

The property was described in the 1926 Annual Report, and as no work since has been done, except a crosscut tunnel which will be referred to, the reader is referred to that report. Briefly, the mineralization occurs in an altered contact-zone, about 50 feet wide, between granodiorite and crystalline limestone. The mineralized belt is from 10 to 35 feet wide, with an average of 10 feet in width, of very fair ore so far as exposed on the surface. The metallic minerals are principally zinc, up to 3 per cent. copper, and a small amount of lead. Five open-cuts on the surface, each over 50 feet long, at intervals of 50 feet, have cut the vein and demonstrated its mineral possibilities and continuity. About 200 feet south of the first open-cut the contact is exposed in the bed of a small creek. A crosscut tunnel was started lower down the creek for the purpose of cutting the contact. This tunnel has been extended 60 feet this winter after the installation of the compressor plant and had just struck the mineralized contact when work had to be stopped. A drift now along the contact of 300 feet will put it under the best surface showing at a depth of 80 feet and should give some conclusive information. Further depth can be obtained either by sinking on the ore or by driving a long crosscut tunnel from the surface through the granite to the ore.

The property is being carefully and efficiently handled under the supervision of Grierson and Harris, two of the original owners. All indications lead one to believe that a large tonnage of at least milling-grade ore will be developed, with a good chance of encountering lenses of shipping-ore.

**Copper King.**

This group is owned by Thomas Russell, of Vancouver, and associates. There are two claims in the property—the *Copper King*, staked in 1924, and the *Pott*, staked in 1927—situated about a mile from the beach at Humpback bay, on the north coast of Vancouver island, on Johnstone strait. There is a fair foot-trail to the showings over a ridge of 900 feet elevation and down to the showings at 760 feet elevation. The work has been done on a cropping near the head of a steep gulch, showing about 1 foot of fine chalcopyrite ore in a quartz gangue in greenstone formation. A few pieces taken as a sample to get the gold and silver contents assayed: Gold, trace; silver, 0.6 oz. to the ton; copper, 10.8 per cent. I could not see very much of this cropping as it had been pretty well buried up by trees and heavy wash that had apparently only recently come down the gulch. There may be other showings as well, but not being familiar with the property I did not attempt to find them.

**Spider.**

This claim is owned by John Snapley and is situated on the point below Elk bay, on the east coast of Vancouver island, about 20 miles north of Campbell river. A 100-foot tunnel has been driven at the base of a steep bluff, starting just above high tide, following some quartz-feldspar stringers and small veinlets of a mixture of pyrite, magnetite, and pyrrhotite in a greenstone formation. Higher up on the bluff there are a number of small seams of iron sulphides, showing occasionally a little copper, but they are too small and scattered to indicate any extensive mineralization. A short distance south of this another tunnel has been driven 60 feet on a small shear-zone in the country-rock. At the mouth of the tunnel is a small bunch of chalcopyrite, frozen to one wall, which I suppose is the cause of the tunnel; nothing further, however, has been found. Altogether the possibilities are not encouraging.

### Thurlow Island Section.

**Constitution.** Dave Cox is the owner of this claim, situated on the north-west corner of Thurlow island at the beach. Near the contact of granite and greenstone, in which there are bands of limestone, is a shear in the greenstone up to 4 or 5 feet wide, the filling of which is mineralized with pyrite carrying no values. A tunnel has been driven about 100 feet on a bearing of N. 60° W. (mag.), supposedly following this shear, which strikes N. 30° W. (mag.). The tunnel is therefore to the left of the vein. However, judging from a couple of croppings farther up the hill, there seems to be small chances of developing anything of importance.

**Hope.** There are three claims in this group—the *Hope*, *Hope No. 1*, and *Hope No. 2*—owned by Greenlaw, Campbell, and P. MacDonald, of Shoal Bay (Thurlow P.O.). The group is situated on the east side of Thurlow island on Nodales channel and is a restaking of the old *Dawn* group, reported in 1919 in part as follows: "The ore on the *Dawn* group occurs as a vein at the contact of the altered sedimentary rocks and granodiorite. The gangue is quartz and the mineralization iron pyrites with some chalcopyrite. The results from assaying average samples of the ore from the mine-workings show that most of the values are in gold and silver, but that the values are quite variable. An average sample across 15 inches of the vein at the face of the adit-drift assayed: Gold, 1.8 oz. to the ton; silver, 8 oz. to the ton; copper, *nil*. Another sample grabbed at the collar of a shaft said to be 17 feet deep, but full of water, assayed: Gold, trace; silver, 0.4 oz. to the ton; copper, 1.3 per cent. Development-work consists of an adit-drift 70 feet long, a deep open-cut about 50 feet higher elevation than the adit, and the shaft about 200 feet south-easterly from the portal of the adit."

Some prospecting might be done in the vicinity of the $36-to-the-ton gold assay, with the hope of finding an ore-shoot of sufficient tonnage to pay to concentrate. The ore would be ideal for concentration as there is no other mineral than pyrite and chalcopyrite, the pyrite apparently carrying the gold values.

### Quadra Island Section.

**Lucky Jim.** This group was worked about 1910, when a considerable tonnage of copper-gold ore was shipped to the Ladysmith smelter. In 1927 it was optioned by the Glasord Mining Corporation, Limited, and some exploratory work done under the supervision of R. Crowe-Swords. The Glasord Mining Corporation was incorporated in July, 1925, with a capitalization of $1,000,000, divided into 1,000,000 shares, with the registered office at 509 Richards Street, Vancouver.

Considerable surface work was done on the *Lucky Jim*, disclosing some very promising-looking ore showing free gold. A trial shipment, however, of 10 tons sent to Granby smelter at Anyox gave disappointing gold values, less than $1 to the ton, with a little over 5 per cent. copper. Mr. Crowe-Swords informs me that a shaft was sunk 45 feet which convinced him that the property did not meet the requirements of his company and consequently work was stopped in September.

**Wyho.** This is an old property of two claims, the *Wyho* and *Prospector*, situated on Quadra island, about 7 miles from Granite Bay, which is a port of call for the Union Steamship Company's boats. The claims are now owned by Albert Ross, who has done considerable additional work on them during the past five years, ably assisted by "Galena," the goat, who is a real factor in the "table-supply" department, besides pushing the car in and out of the tunnel and helping the boss pack grub from Granite Bay. Between 300 and 400 feet of old work was done on a shear-zone about 200 feet wide in a amygdaloidal basalt. Within the zone are small streaks and bunches of chalcocite and bornite in a gangue of calcite and sheared country-rock. The strike of the zone is S. 70° E. (mag.) into the hill. Mr. Ross has been continuing one of the old drifts and the last 40 to 50 feet has been in fair ore, the present face of 5 feet in width showing an appreciable amount of chalcocite in small stringers. This is sorted as brought out and from 30 to 40 tons have been accumulated on the dump. There are no gold or silver values of any account in the ore.

### Phillips and Frederick Arms Section.

This particular section was the scene of extensive mining operations thirty years ago, when a considerable tonnage of ore was being mined and numerous properties under development.

**Glasord Mining Corporation, Ltd.**

This company was incorporated in July, 1925, with a capitalization of $1,000,000 at $1 a share, with its registered office at 509 Richards Street, Vancouver. Operations of the company are under the direction of R. Crowe-Swords. During 1927 the company has had a few men exploring the country around Phillips arm, particularly that area between the *Doratha Morton* and *Alexandria*, with reported satisfactory results. I am informed that it is the company's intention to continue this work during the season of 1928.

**Doratha Morton.**

This group was under option to the Glasord Mining Corporation and considerable work done on it during 1926, but nothing in 1927. I am not informed as to the ownership of the property at present. I made a hurried trip through the workings this year, but my examination was not in sufficient detail to hazard any prediction as to the possibilities of the property. It apparently has not been exhaustively explored either laterally or to depth. The greatest depth on the vein is obtained in the No. 3 tunnel, 240 feet below the croppings, and where only about 100 feet of drifting has been done. Lateral drivage has been confined mainly to the No. 1 tunnel, of which there is about 350 feet of drifting to the east, at a depth of 120 feet below the croppings, and 220 feet of drifting to the west to the surface.

The ore mined, amounting to about 10,000 tons, was stoped from No. 1 tunnel-level up to the surface, underhand stoping proving that the ore extended only a few feet below the level. The ore occurred in three pockets and averaged about $12 to the ton. The success of future exploration-work would therefore depend on the recurrence of similar ore-pockets.

**Monte Cristo.**

This is an old Crown-granted claim situated north of the holdings of the Alexandria Mining Company on Phillips arm. It is under lease from the Crown to the Glasord Mining Corporation, Limited, which under the supervision of R. Crowe-Swords did some work on it in 1926. Camp buildings were erected on the beach and a fair road built from tide-water to the old workings. Later a tunnel was started just about high tide and driven about 50 feet. I judge, without surveying, that this crosscut tunnel from the beach would need to be several hundred feet long to get under the old workings, which are at an elevation of 400 feet.

Three or four open-cuts and two short tunnels have been driven on a band, or vein, of pyritized igneous rock, showing in places a little chalcopyrite. None of the open-cuts I saw looked very encouraging. The upper tunnel was driven in a very oxidized material showing little sulphide mineralization; another tunnel a few feet under this was in solid formation, but shows no ore to amount to anything. I cannot see that the upper showings warrant a long tunnel to obtain depth on them; in fact, they did not impress me as at all promising.

**Alexandria Mining Co., Ltd.**

This company was incorporated in September, 1925, with a capitalization of $500,000, divided into 1,000,000 shares of 50 cents each. The registered office is 905 Credit Foncier Building, Vancouver. The holdings consist of the following Crown-granted mineral claims: *Alexandria, Waterloo, Emperor Fraction, Highland Laddie, Duke, Jubilee,* and *Duchess;* adjoining the holdings of the Glasord Mining Corporation, which lie to the north. The claims are located from the beach up the hill, the lower tunnel being just above high tide, altogether an ideal situation. The general formation is a wide zone of altered rocks, such as argillite, schists, greenstone, quartz, etc., contained in the Coast range of granodiorite, from which the mineralization is derived. The quartz veins within the zone are, as a rule, mineralized with pyrite and chalcopyrite carrying gold and silver values.

On the *Alexandria* the pyritized quartz vein will average between 5 and 6 feet in width. Four tunnels have been driven, but only the lowest one, at the beach, has drifted on the vein, which is continuous the full length of the tunnel of 530 feet. The ore-shoot extends from the collar to 300 feet in the tunnel. Six crosscuts have been driven from this level—two at 85 feet from the portal, 75 feet to the right and 80 feet to the left. At 130 feet in a wide dyke is crossed which offsets the vein a few feet to the left. At 385 feet two more crosscuts were driven, the one to the right being 68 feet and to the left 33 feet; also crosscuts have been driven both ways at the face, 25 feet to the east and 67 feet to the west. At 185 feet from the portal a raise was driven 50 feet, which is claimed to be in ore all the way, and connected with the tunnel above. The three tunnels above this, at 70 feet, 300 feet, and 400 feet elevations respectively, are probably too far to the west and therefore parallel the vein in its hanging-wall, although the top tunnel shows high-grade gold values in places. These upper tunnels were all started at the foot

of the bluff just at the top of the talus-slope. What is apparently the continuation of the vein was disclosed farther up the hill this summer, and lining this up with the lower tunnel suggests that the vein lies under the rock-slide and consequently east of the three upper tunnels.

The vein has been thoroughly sampled throughout the length of the lower tunnel by cuts at 5-foot intervals by H. Rodes, showing the ore-shoot to extend for 300 feet. The ore values, which are principally gold and a little silver, vary up to $25 to the ton, the whole averaging $8.20 to the ton for an average width of 5 feet. I do not know just what proportion of the gold value is free-milling or whether all the values are carried in the sulphides; if the latter is the case a flotation-cell would recover all the values.

There is a good camp on the beach and a compressor plant at the mouth of the beach tunnel. I am reliably informed that the company has been successful in financing and that operations will be started on the property early in 1928.

**Blue Bells.**

There are four claims in this group—*Blue Bells*, *Dashwood*, *Black Prince*, and *Gold Bug*—situated on the west side of Frederick arm, about 1½ miles up from the beach. I understand that the property is held by R. F. Hill, of Seattle. It was under option in 1920 to the Ladysmith Smelting Corporation, which did some exploratory work and sampled all the showings. The main geological feature is an immense deposit of quartz in a belt of metamorphosed rocks included in the Coast granodiorite. The quartz is in greater part barren, but a portion of it is more or less pyritized, accompanied in places by a little chalcopyrite. It would require comparatively small average values to make this a very valuable deposit.

The cropping shows a width of at least 50 feet of quartz, having a strike of N. 70° W. (mag.) and intruded by many small basic dykes. There are two tunnels, the upper one 1,750 feet elevation, which is about 100 feet vertically lower than the croppings, and the lower one at 1,600 feet elevation, both cutting the quartz-body. The upper tunnel shows that there are two veins, one with a strike of N. 60° to 70° W., the same as the croppings, and another striking N. 20° W. (mag.), which is about 30 feet in width in the tunnel, all apparently of barren quartz. The main body is cut at a small angle and extends for 100 feet in the tunnel. In the lower tunnel the N. 20° W. body is cut, disclosing about the same width, 30 feet, as in the tunnel above. The continuation of the tunnel did not encounter the big quartz-body, for nothing more than a few small veins are shown. In the upper tunnel drifts were driven on the first vein both ways from the adit for a total of 140 feet, and what is apparently the same ore-body was drifted on in the lower tunnel for about 100 feet. There is therefore an immense body of quartz, but whether the values are sufficient to make it a profitable ore is the fact which must be determined.

**Lagoon.**

The following description is abstracted from the report of the property contained in the Annual Report of 1923, page 255: The group contains the Crown-granted mineral claims *Colossus*, *Rio Tinto*, *Bluebell*, *Portage*, and *Champ Ness Fraction*, which are held under lease from the Government as reverted Crown-granted claims. To these have been added the *Lagoon* claim, staked later. The claims are located on Estero basin at the head of Frederick arm, from which latter the basin is reached through the narrows on high slack tide. They are situated about 2 miles up Buker creek and I understand there is a good wagon-road from the beach.

The rock formations are given as predominately diorite with metamorphosed sedimentaries, the whole of which has been subjected to intense shearing action which has broken up the different formations. The mineralization occurs in these shear-zones and consequently is somewhat erratic.

There are four tunnels; the No. 1 (or highest), at 1,400 feet elevation, is about 100 feet below the vein-croppings; the No. 2 is 90 feet below the No. 1; an intermediate level is 56 feet below No. 2; and the No. 3 tunnel is 155 feet below No. 2. The No. 1 tunnel crosscuts 161 feet to the vein and then drifts 76 feet east and 182 feet west. The No. 2 level is also a crosscut with drifts on the vein, the whole totalling 690 feet of work. The No. 3 level was driven 900 feet as a crosscut to the first showing of mineral and then continued another 100 feet to a fault which apparently cuts off the mineralization. Two drifts from this level have been driven west, No. 1 about 50 feet and No. 2 about 100 feet in length.

No description is given in the above report of the results obtained in any of the underground workings so far as ore-bodies are concerned. Seventeen assays were given taken from the west ore-body, which ore-body is not mentioned in the report at all. The first eight of these assayed

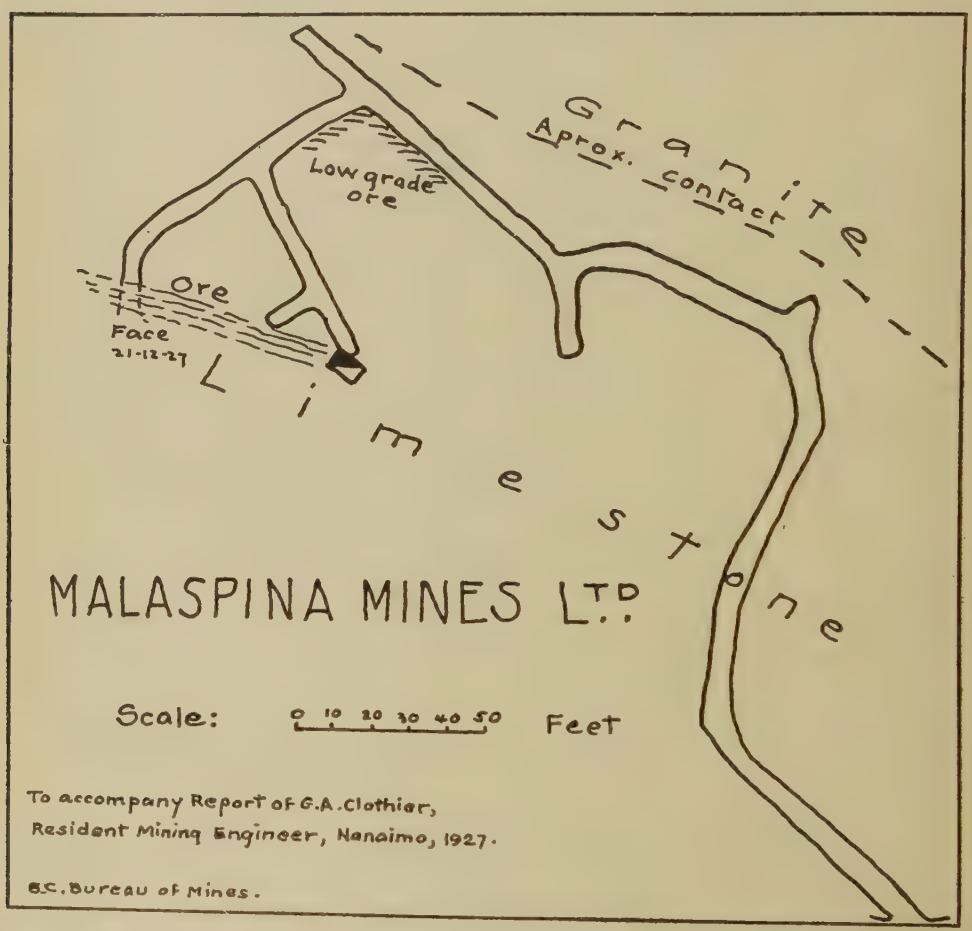
gave an average of 4 per cent. copper for an average width of 7½ feet, the remaining nine samples an average of 5.7 per cent. copper for an average width of 6 feet, but where or how the samples were taken is not stated; consequently no idea can be formed as to the continuity and importance of the ore-body.

### Powell River Section.

This is the area in the vicinity of the town of Powell River, where one of the largest pulp and paper mills on the continent is situated and is a port of call for all the Coast steamships. An auto-road is gradually being extended both ways, up and down the Coast, from this point and is now north to Lund and south for several miles. Powell lake, back of the town, extends for 30 miles into the Coast range, therefore offering a very favourable field for prospecting.

**Malaspina Mines, Ltd.**

This company was incorporated in July, 1925, with a capitalization of $1,500,000, divided into 1,500,000 shares, with its head office now at 846 Hastings Street West, Vancouver. Its holdings consist of the *Florence, Scott, Red Metal, Hope Fraction, Victory,* and *United* claims, situated a short distance from the beach, about 10 miles north of Powell River, from which there is a fair auto-




road to the mouth of the tunnel on the *Florence*. There is a beautifully situated, commodious camp on the beach about 350 feet lower than and half a mile from the tunnel. Altogether it is the most ideally located property for everything except mining, which on account of the gradual slope of the ground from the beach will eventually have to be done by sinking. A tunnel from tide-water would have to be 3,000 feet long to obtain a depth of 400 feet under the present workings.

The general rock formations are limestones and intrusions of wide belts of granodiorite. Considerable metamorphism or alteration of the limestone is shown in places along the contact. The limestone is intruded by many basic dykes as well, which apparently do not affect the mineralization in any way. The chief minerals are pyrite and sphalerite, with some chalcopyrite in places. The mineralization occurs in the limestone and not necessarily along the immediate contact with granite; in fact, from the number of isolated ore-croppings, which apparently have no continuity, I think it very probable that the minerals from the underlying granite have replaced the limestone along joint-planes and intersections. The ore-shoots will therefore be more in the nature of chimneys, which may be connected by lateral flows along the fractures, forming narrow veins between larger ore-bodies. Any narrow seams of ore encountered should therefore be followed.

Exploratory work consists of much stripping, open-cuts, and shallow pits on the surface; a tunnel; and several diamond-drill holes bored at right angles to the contact strike. The underground work was done by former operators, who drove over 400 feet towards obtaining a depth of 44 feet under the shaft, which has the most attractive surface ore-exposure, and about 70 feet under No. 2 diamond-drill hole. No ore of importance was found in this work and the option was thrown up. Operations this year under the direction of W. G. Dickinson have consisted of the extension of the underground workings toward getting under some of the surface showings. With so much underground work already done, this was considered the most feasible scheme to work on, rather than sink on the individual showings from the surface. Ore was encountered in about 30 feet of driving in the tunnel, showing on the south side of a slip on the left side of the tunnel going in, for a length of about 30 feet. There was no ore on the north side of the slip. At 30 feet there was a decided break or fault running north-south which was cut through, but no ore found on the other side of it. The tunnel was then turned at right angles to the left, following the ore along the fault for about 40 feet, where it pinched out. It was then decided to turn at right angles to the left and head for the shaft-showing, which was encountered in about 60 feet. Mr. Dickinson reports that the flow of water was so heavy at that point under the shaft that further work was prohibited. A crosscut was therefore started 10 feet back and driven 10 feet to the vein, which caved in and stopped work at that point as well. Going back to the crosscut along the fault, this was continued straight ahead, striking the ore-body, which has been crosscut for about 15 feet so far. This ore-body is reported as being very satisfactory and work will be resumed at this point early in 1928.

There has been a lot of work done on this property, nearly 500 feet of underground workings, with very little results to show for it. The position the property is in to-day could have been accomplished in about a quarter of the time and a quarter of the cost by sinking the shaft to a depth of 50 feet and drifting about 65 feet. Work in 1927 amounts to about 200 feet, though I have not the exact figures from the management. It looks now as if one of the main ore-bodies has been found underground and its exploration may prove it a very important one and an important factor in the future of the property.

**John Bull.**

This group of three claims—*John Bull*, *Hematite*, and *Extension*—adjoins the Malaspina Mines on the north and is owned by Wm. Uzzell, of Powell River. At the time I was on the property, about the middle of August, it was under option to Mr. Barrett, of the Northland Mining Company, Limited, and a syndicate was being organized in Powell River to take over the option. The formations and ore occurrences are identical with the Malaspina Mines Company's holdings and were described in the 1926 Annual Report.

**Ophir and Shamrock.**

The *Ophir* and *Shamrock* are situated on the north side of Powell lake, about 3 miles from the town of Powell River, and are owned by J. Shearman. The claims are very accessible by way of an old skid-road running down to the lake from the main highway. The showings consist of pyritized quartz veins up to 3 feet in width, dipping flatly in the dioritic country-rock. The 25-foot tunnel on the *Shamrock* cuts across such a vein, showing pyritized quartz in which are small seams carrying galena and zinc, where the values are found. These seams are not large enough to be of importance. Several of these quartz veins have been discovered and shot into, but are consistently without values.

Powell River Co., Ltd.

The pulp and paper plant of this company, situated at Powell River, consumes approximately 550 tons of limestone a month, obtained from the company's quarry at Marble bay, Texada island. The limestone for this purpose must be free from dirt and low in insoluble, iron, and aluminium, with a high percentage of calcium carbonate and a limited amount of magnesium carbonate. An average satisfactory limestone assays: Calcium carbonate, 95 per cent.; magnesium carbonate, 3.6 per cent.; iron and aluminium, 0.3 per cent.; silica, 1.1 per cent.

Some limestone samples were taken from Nelson island and tested for lime-making purposes, but were found to analyse as follows: Insoluble, 15 per cent.; calcium carbonate, 84 per cent.; aluminium, trace; iron, 0.5 per cent.; magnesium carbonate, *nil;* too high in insoluble.

### Texada Island Section.

Mining operations in this section have been very limited this year. The limestone-quarries of the Pacific Lime Company at Blubber bay have been the chief activity. Assessments are kept up on a number of groups and there is always some prospecting being done.

On instructions from the Department of Mines, 20 tons of magnetite ore is being taken out from the *Volunteer* to be shipped to Vancouver for experimental purposes, under the provisions of the "Iron-ore Supply Act."

Pacific Lime Co., Ltd.

This company's operations at Blubber bay, on the extreme north end of Texada island, consist of limestone-quarries and kilns and a sawmill in connection, from which the refuse supplies fuel for the burning of the limestone. About 175 men are employed, fifty in connection with the sawmill and the balance in the production of lime, under the supervision of O. N. Walker. The plant has been increased in 1927 by one kiln, making a total battery of six, handling 180 tons of lime-rock in twenty-four hours, which produces 900 barrels or about 90 tons of lime, the shrinkage in burning being about 50 per cent. A portion of this is hydrated and put up in heavy paper sacks for the market. This process consists in adding 350 lb. of water to a ton of lime, which slakes it and reduces it to a powder. This is then thoroughly mixed and pulverized and passed through vacuum-tanks, where the impurities, partially or unburnt particles of limestone, are removed and reground for fertilizer.

Nothing less than 4-inch size rock is fed to the kilns because of packing and thus hindering the circulation of the heat. The coarsest of the undersized below 4 inches is shipped to the Granby smelter at Anyox in the Granby's own freighters, the company using from 1,500 to 2,000 tons a month for ore-fluxing purposes.

Some of the finer screenings from the quarry are ground into hen-grit and fertilizer. Three of the six kilns are fired with sawdust from the sawmill on specially arranged grates using forced draughts. The other three are fired with slabs that have been kiln-dried for forty-eight hours at a temperature of 200° F. It is estimated that the use of the sawmill wastage for firing makes a saving of at least $100 a day. The burnt limestone is drawn off at certain intervals, after which fresh limestone is fed in. The company manufactures its own barrels and has two ships carrying cargoes of lumber and lime to the principal Coast market, San Francisco.

The company is strong on community welfare, which is certainly reflected in the artistically built dwellings furnished with light and water, beautiful lawns and flower-gardens, community hall, sport-field, tennis-courts, etc., making one of the most self-contained and contented small communities that I have seen.

B.C. Gold Mines, Ltd. (Gem).

This company was incorporated in March, 1924, with a capitalization of $1,000,000, divided into 1,000,000 shares at $1 each, and with its registered office at 414 Standard Bank Building, Vancouver. Its holdings consist of the *Gem* group (formerly *Nutcracker*) on Texada island, about 2½ miles from Vananda. I was unable to get underground on account of the shaft being full of water and there is little to be seen in the way of ore or veins on the surface. From former Annual Reports, 1924 and 1925, I gathered that the vein is of pyritized quartz, averaging about 2 feet wide and occurring in the porphyritic country-rock. The shaft has been sunk to 150 feet and drifts run on the 50-foot and 100-foot levels. No stoping is mentioned and I therefore judge that the mill dump represents ore taken out in development-work. W. M. Brewer in his 1926 report gives an assay of the mill tailings as gold 0.70 oz. to the ton, which would seem to corroborate in part the information advanced me, that the cause of the non-success of the enterprise was

not lack of ore carrying milling values, but the fact that the gold would not amalgamate and was therefore unrecoverable. There is a serviceable plant and equipment on the property, comprising a gas-hoist, small gas-driven compressor, a gas-engine driving the pump, and a small mill consisting of crusher, Denver quartz-mill, two amalgamating-plates, etc., driven by a fuel-oil engine.

**Chickamin Mines, Ltd. (Marjorie).**

This company was incorporated in October, 1926, with a capitalization of $500,000, divided into 2,500,000 shares at 20 cents each, with its registered office in Victoria. The company acquired the *Marjorie* group on Texada island, on which considerable work had previously been done, principally a shaft sunk to the 100-foot level. Work was started in the fall of 1926 and consisted of driving a crosscut from the bottom of the shaft for a distance of 250 feet for the purpose of cutting and exploring several parallel pyritized quartz veins exposed on the surface by extensive trenching and stripping. This underground work was obviously not very encouraging, as the work was closed down in May and the shaft allowed to fill with water.

**Nancy Bell.**

There are six claims in this group—*Nancy Bell, Silver Tip, Thyee, Whistler, Golden Arrow*, and *Mountain Chief*—all Crown-granted, situated on the north-west side of the island, about three-quarters of a mile from the beach. The owners are Hugh MacMillan, Nanaimo; W. MacDonald, Vananda; and the Estate of Wm. Lee. The general rock formation is porphyry containing belts of crystalline limestone. On this group there are two veins, both shear-zones in the volcanics. The first vein has been opened and extensively prospected for several years by way of surface cuts and two shafts, one of which is 100 feet deep and another 160 feet. Judging from the dumps at these shafts there was no improvement in the ore at depth. On the surface the shear shows a width of 4 feet in places, but though there is about 10 inches carrying stringers of quartz, mineralized with pyrite, zinc-blende, and galena, I did not see any place on this vein worth any extensive development.

A few hundred feet east of this is another shear, showing a width of 6 feet between walls, striking at N. 60° W. (mag.) and dipping about 75° to the west. The main work done is a shaft about 40 feet deep, which was half-full of water. It shows the vein to be 6 feet wide of quartz and calcite mineralized with stringers and small veins of pyrite, zinc-blende, galena, and chalcopyrite, about 2 feet in width on the hanging-wall showing a greater concentration of minerals. One of the owners on the ground, Mr. MacDonald, states that the vein was narrowed by a limestone-belt coming in, but widened again as further depth was obtained. About a hundred sacks of ore was sorted out from the sinking of the shaft. A sample of this taken from the sacks gave assays of: Gold, 0.64 oz. to the ton; silver, 4.4 oz. to the ton; copper, 1.5 per cent.; lead, *nil;* zinc, 18 per cent.

About 200 feet south of the shaft an open crosscut opened up the vein to its width of 6 feet, in which there are 2 to 6 inches in the hanging-wall of solid sulphides, the balance being sparsely mineralized. The sulphides assayed: Gold, 0.14 oz. to the ton; silver, 10 oz. to the ton; copper, 7.5 per cent.; zinc, 12 per cent.

In my opinion the showings on this vein justify the sinking of the shaft to 100 feet depth and then some drifting on the vein. The ore should make two good concentrate products, zinc and copper.

**Sentinel.**

This group consists of the *Sentinel* and *Red Wing* claims, owned by R. Swan and situated near Burditt's ranch. The general rock formation is blue limestone, within which is a belt of apparently a somewhat more silicified limestone, in which occur grains, small bunches, and veinlets of pyrite, grey copper, galena, and zinc-blende, in small calcite-seams near the surface. A lot of surface work has been done over a considerable area, showing patches of mineralization. A shaft was sunk 20 feet on the edge of the blue limestone, from which about 2 tons of ore was sorted from oxidized seams near the surface. I found no minerals in the bottom of the shaft, where the formation is less broken. These 2 tons were shipped and gave returns of $35 to the ton. Two tons more were sorted from different places where surface work was done and gave smelter returns of $50 to the ton. There are about fifty sacks of sorted ore consisting of oxidized surface material carrying galena and grey copper.

Owing to the gentle slope of the country here, any depth would have to be obtained by sinking, which with the inevitable pumping would be too expensive for prospector's work. There does not appear to be anything definite enough to warrant much work on it.

**Graham and Burditt Claims.**

There are seven claims in this group, situated about 4 miles from Vananda. There was one original claim, to which six more were added by staking in the names of Russell & Hancock, of Vancouver, who had an option on the property up to July, 1927. The showing consists of a basic dyke, essentially hornblende, up to 4 feet in width, mineralized with pyrite and chalcopyrite, striking north-westerly and lying in crystalline limestone. This vein-dyke has been traced on the surface for several hundred feet, showing a small content of chalcopyrite wherever broken into. On the farthest north cropping, at 350 feet elevation, an old shaft has been sunk 25 or 30 feet, from which probably 5 tons of fairly good ore is piled on the dump. This shaft was recently retimbered down about 15 feet and cleaned out some 5 feet below that. The dyke is apparently cut off at this depth, though not enough had been cleaned out to show the exact conditions. It looks as if the top portion had been faulted to the west and therefore a crosscut below the fault to the east should pick the vein up again. The only values are in copper, no gold or silver, and it is very doubtful whether the copper content justifies very much further work.

Some 400 to 500 feet west of this are other hornblende dykes on which the amount of work done indicates that they were pretty thoroughly explored years ago and probably some chalcopyrite sorted and shipped. None of the showings seem to have justified any deep work as the cuts and pits are all shallow. At the present price of copper I think it would be impossible to sort out enough clean chalcopyrite to be profitable.

**Stromberg.**

(*See* 1926 Annual Report.) This group is owned by Wm. Stromberg, of Vananda, and is situated on the west side of Texada island, opposite the head of Lasqueti island. There are seven claims in the group, starting at the beach and extending one claim wide up the hill. The claims are *Edith*, *Kate*, *Delora*, *Ethel*, *Bullion*, *Hill*, and *Big Bluff*. The country-rock is a mass of porphyry, probably andesitic, surrounded except along the beach by crystalline limestone. On the upper end of the claims the porphyry narrows down to a small strip in the limestone, while on the beach it must be a mile or more in width. The porphyry-limestone contact on the south side of the porphyry strikes N. 60° W. (mag.) and on the north side about east-west. Heretofore the greater part of the work had been done up the hill at about 700 feet elevation, where extensive open-cutting and stripping exposes several patches of fairly good chalcopyrite and bornite ore across a width of over 100 feet. So far as I could see, the mineralization consists of pyrite, chalcopyrite, bornite, and a trace of galena and zinc-blende and occurs in spots, chalcopyrite where there has been any oxidation on the surface and some bornite disseminated in the porphyrite. There is a diorite dyke striking down the hill at N. 30° E., which is the general trend of the mineralized patches, though they do not always occur at or near the dyke, and it is therefore questionable whether the dyke affects the mineralization or not.

At 350 feet elevation, or about half-way down on the claims and about the centre of the porphyry-mass, another mineralized belt was discovered early this spring which seems to have some possibilities. It strikes about N. 60° W. (mag.), paralleling the south porphyry-limestone contact. Only a little surface work has been done so far on this, but it is fairly well exposed for some distance along a bare ridge. The few shots show a mineralization of bornite disseminated throughout the igneous rock, and also occurring in small seams, along a distance of from 200 to 300 feet and across a width of at least 60 feet. The small parallel seams of bornite make, in places, a very nice ore. I think this ridge is worth a considerable amount of surface exploratory work, which will probably justify subsequent diamond-drilling. It would be an ideal situation for open-mining of a milling-grade ore.

Some work has been done below this belt on patches of mineral nearer the borders of the porphyry, but they are, like the showings on the upper end of the claims, too isolated and too small for low-grade ore-bodies.

### Lasqueti Island Section.

**Lasqueti Mining Co., Ltd. (Venus).**

This company was incorporated in October, 1920, as a private company with a capitalization of $250,000, and its registered office in the Birks Building, Vancouver. The company acquired the *Venus* group, situated on the north-east side of Lasqueti island, extending from Barnes cove nearly across the island, and owned by the Kurtzhals Bros. The mineral claims *Mars*, *Venus*, *Hill 60*, and *Venus Fraction*, all Crown-granted, and the *Leo*, held by annual assessment, comprise the group. The property has now been taken over by the B.C. Operators, Limited, a company organized in April,

1927, with a capitalization of $100,000, with its head office at 736 Granville Street, Vancouver. I understand that a syndicate composed of shareholders in this company is planning to do some further development-work on the property in 1928.

During the operations of the former company a considerable amount of development was done, consisting of surface cuts; a 100-foot tunnel just above high tide at Barnes cove; a shaft from this tunnel 100 feet deep and a drift from the bottom of the shaft for a distance in the beach tunnel, stoped through to the surface and underhand-stoped about 25 feet below the tunnel-level, producing about 300 tons of ore, which netted about $25 to the ton in gold, silver, and copper values. The main values were in copper, though the gold values ran from $6 to $15 to the ton. Later a number of surface cuts were made, tracing the vein through two claim-lengths. These ore-exposures are small, showing a width from a few inches to 2 feet, but show persistent values in gold and copper throughout.

There are three veins on the property, the centre one just mentioned being that on which practically all the work has been done. This is mostly in diorite, which intrudes the basalt of the Vancouver volcanics, but cuts through the basalt higher up the hill, in which formation the vein seems to be pinched to a few seams of quartz. On the south end the vein again makes in the diorite, the farthest showing on the *Leo* being probably the most promising. The north end of the vein on tide-water is, however, the logical place from which to develop the property. In view of the fact that the beach tunnel has about 8 inches of solid sulphides in the face assaying $16 to the ton in gold and 14.5 per cent. copper, and the ore-exposures on the surface beyond this so promising, I consider this tunnel well worth extending a further few hundred feet, in which it will obtain sufficient depth to hold important ore-shoots, if found. The west vein is in diorite and is close to the west line of the property. Prospecting-work on the adjoining group, owned by Kurtzhals Bros., which the west vein enters, has shown some very promising ore-exposures that might easily develop sufficient ore to call for a small concentrating plant for the separation of the different sulphides. The *Hill 60* vein lies to the east and is all in the basalt. This is the extension southward of the old *St. Joseph* vein, from which gold ore assaying up to $80 to the ton is claimed to have been shipped years ago. This *Hill 60* vein has only a couple of open-cuts on it, but apparently contains the same class of ore as the *Venus* vein and, I judge, has the same possibilities.

Mining and transportation conditions are perfect, as ore can be delivered from the tunnel to scows lying on the mud bottom of Barnes cove, which is a perfect shelter from any weather. There is a good camp ready to use. Everything considered, I would recommend this property for a very considerable amount of development-work.

**Juneau.** This group of six claims, owned by Kurtzhals Bros., of False Bay, Lasqueti island, adjoins the *Venus* of the Lasqueti Mining Company on the west. There are three veins on these claims, the east vein being the west vein of the *Venus*. Vein conditions and mineralizations as exposed by a great deal of surface work are identical with those of the *Venus* group. The property was minutely described in the 1926 Annual Report.

## VANCOUVER MINING DIVISION.

This Division includes the drainage areas into Jervis inlet, Howe sound, and Burrard inlet, and is therefore wholly on the western slope of the Coast range. It is the only producing Division in the district and has the distinction of having the Britannia Mining and Smelting Company, Limited, the second largest copper-producer in the Province and in Canada.

There are over 250 un-Crown-granted mineral claims in good standing, besides the many Crown-granted ones. Prospecting has not been very active this year, but a number of claims have been staked.

### North Vancouver Section.

**Lynn Creek Zinc Mines, Ltd.** The only property in this section of any note is that of the Lynn Creek Zinc Mines, Limited. I have not examined this property, but I gather from reports that there are zinc-deposits of prospective value, but as yet have not been developed. It was supposed that the Porcupine Gold Fields Company was planning on operating the property this spring, but, so far as I can learn, nothing whatever has been done.

HOWE SOUND SECTION.

Britannia Mining & Smelting Co., Ltd.

The operations of this company have been reported on each year for several years and I will therefore confine myself to the work of 1927. I was on the property for two days recently, a day at the mine and one at the beach, during which time every facility was given me to see the mine and plant. This time was of course inadequate to gain more than a superficial idea of the extent of the company's operations; however, an engineer cannot help being forcibly impressed by the well-planned system for efficiency in every department and the consequent economical production. Even the proverbial "squeal" is saved in the concentrator.

The important work in 1927 was the completion of the haulage-tunnel on the 2,700-foot level, which was driven both from the surface and from the bottom of the 500-foot shaft from the 2,200-foot level. This tunnel was extended through to the *Fairview* mine, making a total length of 11,220 feet. The total output from all the mines will be taken out through this tunnel and dumped into the raise down to the concentrator level. A substantial piece of work is now under way in the installation of a 36- by 48-inch Buchanan jaw-crusher 80 feet below the Armour tunnel. The ore, crushed here to 6-inch size, will be delivered to the 4,100-foot or concentrator level by a wing raise which was started at the 3,250-foot level. The 20-ton ore-cars used in the main 2,700-foot haulage will be handled by a rotary dump above the crusher, handling one car at a time. This work will do away with the surface electric railway from the main work-tunnel of the mines, the 2,200-foot, down to the top of the 4,100-foot raise, a distance of about 3 miles.

Altogether some 20,480 feet of mine development has been done in 1927, divided into 8,100 feet of drifting, 2,686 feet of crosscutting, 5,990 feet of raising, 570 feet of sinking, and 2,747 feet of stoping. Diamond-drilling for 1927 was 11,016 feet.

All the mines with the exception of the *Victoria* are stoped on the shrinkage system, the *Victoria* necessitating square setting and filling to within three sets of the working-face on account of the swelling ground.

At the mouth of the 2,200-foot level a 6-furnace blacksmith-shop is under construction, in which the steel of all the mines will be sharpened. Each mine will have its own car fitted with racks for each length of steel. It is expected that all the steel can thus be sharpened on day shift and a substantial saving effected.

The precipitation plant, at the mouth of the 2,200-foot level, was enlarged and its capacity greatly increased this year. It consists of hundreds of feet of small flume through which the mine-water flows over scrap-tin and scrap-iron, replacing the copper in the acidic mine-water and precipitating the copper. This year the plant produced about 500,000 lb. of copper.

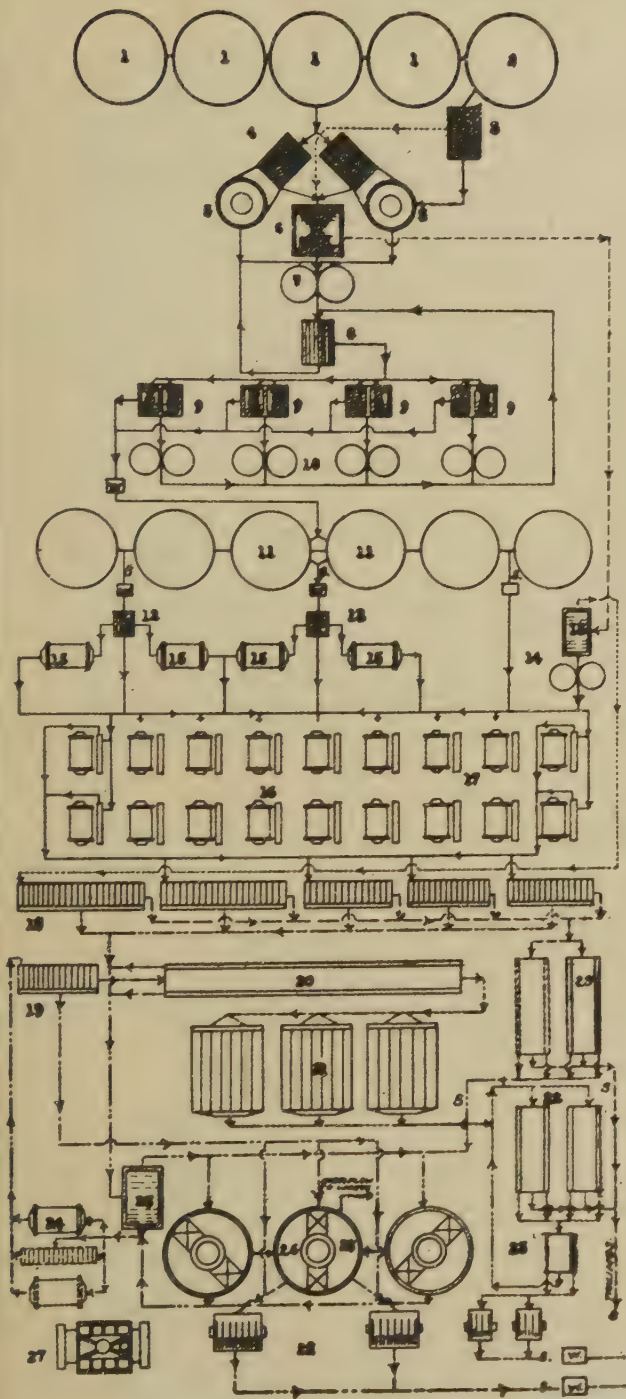
Since 1926 the concentrator has been radically changed and the last flow-sheet is therefore reproduced, which is self-explanatory. The main changes from the milling practice of last year is the thorough washing of all the ore at the head of the mill and the separate treatment of these "original slimes," which contain oxidized and partially oxidized particles of ore, soluble salts, etc., requiring a variable preparation for flotation. The balance, about 90 per cent. of the mine-run of ore, is then a uniform ore requiring a uniform treatment. Additional flotation-cells were installed for the production of a clean pyrite concentrate analysing 49.8 per cent. sulphur, 44 per cent. iron, 0.35 per cent. copper, and 4.5 per cent. insoluble, and now being sold for the manufacture of sulphuric acid.

Another innovation which is proving successful was the installation of a blanket system for the further recovery of gold values occurring as free gold, at a cost of 42.6 cents a ton. The mill is now treating over 4,000 tons daily, turning out a 21-per-cent. copper concentrate and a 0.15-per-cent. copper tailing. The ratio of concentration is about 13.6. The 5-inch balls used in the ball-mills are manufactured on the ground by an ingenious machine devised by the company.

During the year the mine produced 1,395,586 tons, of which 1,349,591 tons were milled, yielding 10,336 oz. gold, 165,361 oz. silver, and 34,037,835 lb. of copper and 38,000 tons of pyrite. The product from the precipitation plant is included in these figures. This is the greatest year's production the company has ever had. The figures given for gold, silver, and copper are the "recovery metals," not gross values.

About 800 men are employed in the mines and about 100 at the beach. The personnel of the staff is C. P. Browning, general manager; J. I. Moore, Jr., mine superintendent; A. C. Munro, mill superintendent.

BRITANNIA MINING AND SMELTING CO., LIMITED
Flow Sheet of No. 3 Britannia Mill.



Legend

(1) 4-500-ton Coarse Ore Bins
(2) 1-Wet Ore Tank
(3) 1-Stat'y Grizzly
(4) 2-Stat'y Grizzlies
(5) 2-7½K Gyratory Crushers
(6) 2-4' x 5' Washing Screens
(7) 1-Set 72" x 20" Traylor Rolls
(8) 1-Oversize Grizzly
(9) 8-Hummer Dry Screens
(10) 4-Sets 54" x 16" Traylor Rolls
(11) 6-600-ton Fine Ore Bins
(12) 2-Sets Hummer Dry Dry Screens
(13) 1-8' x 15' Drag Classifier
(14) 1-Set 42" x 16" Rolls
(15) 4-7' x 12' Ball Mills
(16) 16-5' x 10' Ball Mills
(17) 16-Dorr Simplex Classifiers
(18) 3-14 and 2-21 Cell M. S. Roughers
(19) 1-14 Cell M. S. Cleaner
(20) 1-Forrester Cleaner-Tails Retreatment Machine
(21) Blanket Gold Recovery Plant
(22) 2-Forrester Pyrite Roughers
(23) 1-Forrester Pyrite Cleaner
(24) 1 Concentrate Regrinding Mill
(25) 1-Concentrate Drag Classifier
(26) 3-44' x 14' Dorr Thickeners
(27) 1-Roots Blower
(28) 2-8 Leaf 6' Dia. and 1-4 Leaf 6' Dia. American Filters
(29) Scavenging Forrester Machine

Machines in Dotted Lines Represent Proposed New Equipment

W--Weightometers
S--Samplers

Pyrite Concentrate
CU. Concentrate

Revised January 1, 1928 Approved: [illegible] B.C. Bureau of Mines.

No recent work has been done on the easterly extension of the Britannia belt to and crossing the head of Indian river, where there was great staking activity some years ago.

Other claims on Howe sound and Indian river and the yearly reports containing them are: *Attorney* group, 1918; *Opporgol* group, 1919–20; *Crofton* group, 1924; *Horseshoe* group, 1918.

### Pacific Great Eastern Railway Section.

This includes the country contiguous to the railway from Squamish, its Pacific terminus, to the summit of the Coast range between Alta and Green lakes, which is the limit of District No. 6. This gives a cross-section through the Coast range of about 30 miles, which with Howe sound makes a total distance of about 55 miles across the west slope of the range. Paralleling the range and therefore crossing the railway are many belts and masses of altered sedimentaries and volcanics, overlying and included in the granodiorite and identical with the Britannia belt, which has proven so prolific of mines. Much surface prospecting has been done on these belts and many mineral discoveries recorded, but as yet the *Britannia* is the only one that has been developed to the production stage. The area has, without doubt, wonderful possibilities from a mining standpoint. The Consolidated Mining and Smelting Company has been persistent in its efforts to find and develop a mine in this section, but so far has not been very successful.

**Rafuse.** These consist of four groups—*Radiant* group of six claims, owned by O. W. Rafuse and partners, of Squamish; the *Bruce* group of four claims, owned by Dan. MacKinnon *et al.*, of Vancouver; the *MacKinnon* group of four claims, also owned by Dan MacKinnon and associates; and the *Contact* group of fourteen claims, owned by O. W. Rafuse and associates. These groups were combined for the purpose of optioning them to the Consolidated early this year.

These claims cover a zone of altered sediments and volcanics probably over 1,000 feet in width. What prospecting-work has been done shows in places lenticular bodies of minerals, mainly pyrite with sometimes chalcopyrite, within this zone. A small creek, cutting diagonally across the schistose belt, has exposed in a deep canyon a perfect cross-section of the belt. The better-mineralized bands appear to be the more siliceous ones. It is impossible for prospectors to do enough work on such a zone to make any impression on it towards proving the extent of mineralization. An option was therefore given the Consolidated, which repaired the trail and took in a diamond-drill outfit. I understand that work is being carried on throughout the winter.

The reader is referred to 1921 Annual Report for more details of the *Bruce*, *Radiant*, and *Contact* groups.

Other claims in the vicinity of Squamish are: *Goat Creek* group, 1925; *Sunshine* group, 1924.

**Golden King.** (*See* 1925 Annual Report.) This group, about 10 miles up Ashloo creek, a tributary of the Squamish river, was under bond to the Consolidated this year. The showings were diamond-drilled early in the summer, but evidently did not meet the requirements of the company and the bond was thrown up.

**Blue Jack.** This group, consisting of eight claims—*Blue Jack No. 1* to *No. 8*, inclusive—is owned by E. Hogstrom, of Mons, and A. E. Snow, of Vancouver. The claims are situated on the west side of the Pacific Great Eastern Railway, about a mile from Brandywine falls, from which point there is a good trail to the cabin at 2,200 feet elevation. There is also a fair wagon-road from the station of McGuire, where there is a sawmill in operation.

The showings are exposed in a small creek, where a few shots have been put in, exposing a pyritized greenstone-schist across a width of about 24 feet. The schist-belt strikes north-south (mag.) and dips from 75° to 80° to the west. Within the belt are siliceous bands and patches which are more or less mineralized with zinc-blende and galena associated with a heavier mineralization of pyrites. A sample of some pieces chipped from the best-mineralized portion of about 3 feet in width gave assay returns of: Gold, 0.34 oz. to the ton; silver, 9.6 oz. to the ton; lead, 2 per cent.; zinc, 5 per cent. This showing is at 2,550 feet elevation or about 350 feet above the cabin, from which there is a good trail. Following down the bed of the creek the vein can be traced for about 100 feet on the hanging-wall of the schist-belt to a point where it leaves the creek-bed and disappears under the overburden. At this point a tunnel has been driven, on a bearing of N. 50° E. (mag.) for 45 feet to the foot-wall of the schist-belt, which it then followed north-south for 25 feet. The tunnel starts on the right or foot-wall side of the mineralized belt and is therefore drifting away from the ore. A drift from the end of the tunnel

could be extended another 50 feet and a crosscut then driven to cut under the upper ore-exposure in the creek-bed. No conclusions may be drawn until some depth is obtained and drifting done on the ore. The values as shown in the best ore exposed are encouraging.

**Brandywine.** This group is owned by W. Barclay, D. Boyington, J. MacKenzie, and Wm. Anderson. Mr. Barclay lives at Brandywine falls, where the trains stop going east, and his post-office is McGuire, 2 miles farther east. There are eight claims in the group—*Brandywine*, *Brew*, *Exchange*, *Annie*, *Eureka*, *Pioneer*, *Cyprus*, and *Wild Rose*—situated about 2 miles up the Brandywine river from the railway. There is a good foot-trail from Barclay's cabin to the cabin on the claims, which is at 1,750 feet elevation, or 150 feet higher than the railway.

The mineral-bearing formation is a light-coloured feldspathic rock, quartz porphyry in appearance, forming an extensive zone in the Coast Range granodiorite. Within this zone are belts of schists and small quartz veins up to 6 inches in width, which strike N. 40° W. (mag.) and are generally well mineralized with pyrite, galena, and zinc-blende carrying gold and silver values. On the south side of Brandywine creek, at 1,900 feet elevation, a considerable amount of open-cutting has been done in the steep side-hill, exposing two or three of these mineralized quartz veins. The cut at the creek shows a fine-grained, light-coloured dyke about 3 feet wide, on either side of which is a small mineralized vein of quartz. Neither is of sufficient width, so far as exposed, to be of importance, as it would not be possible to sort out sufficient ore to be profitable. A sample of the sulphides, showing only pyrite and galena and as free from zinc-blende as could be selected, assayed: Gold, $1.60 to the ton; silver, 3 oz. to the ton; lead, 4 per cent.; zinc, 3 per cent. Another selected sample, mainly of zinc-blende, with a little galena and a trace of chalcopyrite, assayed: Gold, $2.40 to the ton; silver, 6.2 oz. to the ton; lead, 3.6 per cent.; zinc, 13 per cent.; about $20 to the ton net in all values. The sulphides therefore cannot be sorted to a shipping-grade ore.

Just west of these veins there is another wide shear in which occur small parallel bedded seams of zinc-blende and galena across a width of from 5 to 6 feet. There is no chance of sorting out the sulphides and sufficient work has not been done to show whether or not there is a possibility of a tonnage of milling-grade ore.

Across the creek from the cabin several open-cuts have been made in a steep bank on small lenses of sulphides occurring in the schistose country-rock. Also a tunnel has been driven 40 feet across the formation, showing the characteristic small seams of sulphides, but nothing of probable importance.

On the *Cyprus*, farther south from the above work, similar discoveries have been made at 2,150 feet elevation, one open-cut there showing a 4-inch vein of zinc-blende and galena.

While there has not been any drifting done on any of these small quartz veins or sulphide-seams, they appear to be too small and the values not sufficient to warrant any very extensive work.

**Amadra.** This group is owned by J. MacKenzie, of Vancouver, and adjoins the *Brandywine* group on the south. At 2,250 feet elevation an open-cut shows a small vein, striking N. 40° W., in a schistose formation. About 8 feet depth has been obtained on the vein, exposing in the bottom about 2 feet in width of oxidation, in which is about 8 inches of fairly solid ore, mainly zinc-blende. A sample from the dump of the best-looking ore, to determine the possibilities for sorting, assayed: Gold, trace; silver, 0.8 oz. to the ton; zinc, 24 per cent. Two other open-cuts, one above and one below the first mentioned, show about the same conditions. The mineralization throughout this schist-belt appears to be greatest where the schistosity is most pronounced and the schists are sericitic and talcose.

Other groups in this vicinity are: *Eleanor* group, 1925; *Astra* group, 1925; *Callander* group, 1918; *Blue Grouse* group, 1918; *Fitzsimmons* group, 1918; *King Solomon* group, 1918.

### Jervis Inlet Section.

So far as I could learn, very little was being done in this section at the time of my trip through it in September.

**Red Mountain.** There are twelve claims in this group—*Vergo Nos. 1*, *2*, *3*, *4*, and *5*, *Leo*, *Jupiter Nos. 1*, *2*, *3*, and *4*, *Sun*, and *Star*—owned by Phil White and T. Groven. The claims are situated at about 4,000 feet elevation on the west side of Britain river, which empties into Jervis inlet from the north-west, at the head of the Prince

of Wales reach. The trail starts from a cabin at the head of a small slough on the south side of the river, but a new trail is being built from a point farther down, along the west shore, at deep water.

Assistance was granted by the Department of Mines towards the improvement of the trail from the beach to the showings, a distance of about 4½ miles and a climb of 4,400 feet over the summit. The owners have spent a good deal of time and money on the old trail, which is in fair condition. There is a tent camp at 2,500 feet elevation. I had a very poor opportunity to size up the country in general, because of a drizzly rain and a dense fog on the top.

The rock formations consist of the typical altered zone included in the granodiorite, consisting of schists, argillites, and volcanics. A summer camp is established each spring on the top of the mountain where the ore-exposures were found and a very creditable amount of work has been done in yearly assessments. In the short time at my disposal I was able to see five open-cuts on the *Vergo No. 2* claim, each of which exposed an ore-showing worth further work. Four of these cuts were in chalcopyrite ore and the other on a small vein of zinc-blende and galena. Assays of samples taken by the owners show good silver values in both the lead and copper ores. A sample assaying 36 per cent. lead carried 39 oz. silver to the ton and one assaying 15.5 per cent. copper carried 33 oz. silver to the ton. The gold values are negligible. These assays are given not as averages of any kind, but merely to show the proportionate values in the precious metals.

I expect to make a more thorough examination of not only this property but the whole section during the coming year.

Other groups which have been reported on in this section are: *Red Jacket* group, 1917; *Baramba* group, 1917; *Jollie* group, 1917; *Norman* group, 1917; *Mendalla* group, 1917; *Copper* group, 1917 and 1922.

## NEW WESTMINSTER MINING DIVISION.

This Division comprises the drainage area of the Fraser river from Point Grey to near Hope, which includes the areas of Pitt, Stave, and Harrison lakes north of the Fraser, and south of the Fraser to the International boundary-line.

There have been considerable mining activities in different sections of the Division this year and I regret that I have not had the time to see more of it. There are about 300 mineral claims in good standing, besides the many Crown-granted properties.

### Pitt Lake Section.

**Pitt Mining Co., Ltd.**

This company was incorporated in June, 1921, with a capitalization of $250,000, divided into 250,000 shares of $1 each, with its head office at 25 Hastings Street East, Vancouver. The company's holdings consist of the old *Viking* group of eight claims—the *Viking*, *Expremier*, *Pioneer*, *Missouri*, *Ivanhoe*, *Vimy*, *Climax*, and *Incline*—all Crown-granted. They are situated on the east side of Pitt lake, about 15 miles from Coquitlam, and are staked from the water's edge up the hill for about three claim-lengths. The situation could not be better for economical mining and shipping; a scow or boat can be loaded at the company's wharf and delivered at the smelter in Tacoma.

The property was reported on in the 1923 Annual Report, since which time the only work done was a crosscut from the main tunnel on the No. 1 vein to the No. 2 vein and about 200 feet drifting on it. The veins are shears in the granodiorite of the Coast range, filled with brecciated wall-rock, cemented with quartz and calcite, mineralized with pyrite, pyrrhotite, and chalcopyrite, with occasionally a little sphalerite. The No. 1 vein only has been developed to any extent. The main adit has been driven 550 feet on this vein, from which three short cuts have been run and a raise of 180 feet through to the surface from a point about 270 feet from the portal. The crosscut to the No. 2 vein was driven at 340 feet in the tunnel. The two levels were driven off the raise, one at 90 feet above and the other at 135 feet above the No. 1 tunnel; small stopes were worked from these levels, obtaining a small tonnage of ore which was shipped to the Tacoma smelter in 1914.

I am informed by the manager, W. H. Wooley, that the average of 900 samples taken throughout the workings averaged: Gold, $1.20 to the ton; silver, $2.40 to the ton; copper, 3.9 per cent. The vein on the 90-foot level opens out to 100 feet in width, but in the main adit-levels it averages about 4 feet.

The property has been actively operated this year. A road was built, with assistance from the Department of Mines, from the beach to the concentrator-site, which is about 100 feet below the main adit. I understand that the framework of the concentrator and adjoining power-house was built and the cement foundations laid for the machinery. The mill is designed for a capacity of 50 tons for twenty-four hours. Ore-bunkers were constructed at the mouth of the main tunnel and at the head of the mill and connected with a surface ore-chute. Altogether this constitutes a very creditable amount of work for the year. There seems to be every reason to believe that, when equipped, this property will make a profitable enterprise.

# INSPECTION OF MINES.

REPORT BY JAMES DICKSON, CHIEF INSPECTOR OF MINES.

I have the honour to submit my annual report as Chief Inspector of Coal and Metalliferous Mines, covering the year ended December 31st, 1927. Appended hereto are the reports of the District Inspectors relative to the production of coal and number of persons employed; reports of the District Inspectors on metalliferous mines; reports of Instructors of Mine-rescue Stations; report of Secretary to Board of Examiners for coal-mine officials; list of fatal accidents reported under the provisions of section 71, subsection (1), "Coal-mines Regulation Act," and section 19, subsection (1), "Metalliferous Mines Regulation Act"; and prosecutions.

PERSONNEL OF STAFF OF INSPECTORS, INSTRUCTORS, AND BOARD OF EXAMINERS, AND THEIR ADDRESSES AT HEADQUARTERS.

*Inspectors.*

| | |
|---|---|
| James Dickson | Chief Inspector, Victoria. |
| James Strang | Inspector, Victoria. |
| Robert Strachan | Senior Inspector, Fernie. |
| Henry E. Miard | Inspector, Fernie. |
| John MacDonald | Inspector, Fernie. |
| H. H. Johnstone | Inspector, Rossland. |
| James W. Jemson | Inspector, Nanaimo. |
| Thomas R. Jackson | Inspector, Nanaimo. |
| John G. Biggs | Inspector, Merritt. |
| Thomas J. Shenton | Inspector, Prince Rupert. |

*Instructors, Mine-rescue Stations.*

| | |
|---|---|
| John D. Stewart | Nanaimo Station. |
| John Thomson | Cumberland Station. |
| John T. Puckey | Fernie Station. |
| Wm. C. Stone | Middlesboro Station. |

*Board of Examiners for Coal-mine Officials.*

| | |
|---|---|
| James Dickson | Chairman, Victoria. |
| James Strang | Secretary, Victoria. |
| H. E. Miard | Member, Fernie. |

Messrs. Strang and Miard and the Inspector of Mines of the district in which an examination is being held form the Board for granting certificates of competency to coal-miners.

An Inspector of Mines is empowered to grant provisional certificates to miners for a period not exceeding sixty days between regular examinations.

INSPECTION DISTRICTS.

The Province is divided into six Inspection Districts, as follows:—

| Inspection District. | Mining Divisions covered by Inspection District. |
|---|---|
| Vancouver Island | Victoria, Alberni, Clayoquot, Quatsino, and that portion of the Nanaimo Division situated on Vancouver Island. |
| Southern Coast | Vancouver, New Westminster, and that portion of Nanaimo Division situated on the Mainland. |
| Northern | Atlin, Liard, Stikine, Portland Canal, Nass River, Omineca, Peace River, Skeena, Bella Coola, and Queen Charlotte Islands. |

| Inspection District. | Mining Divisions covered by Inspection District. |
|---|---|
| Nicola-Princeton | Cariboo, Quesnel, Clinton, Lillooet, Kamloops, Ashcroft, Nicola, Vernon, Similkameen, and Osoyoos. |
| West Kootenay and Boundary | Revelstoke, Lardeau, Trout Lake, Ainsworth, Slocan, Arrow Lake, Slocan City, Nelson, Trail Creek, Greenwood, and Grand Forks. |
| East Kootenay | Fort Steele, Windermere, and Golden. |

The Inspectors cover both the coal and metalliferous mines in their respective districts.

## PRODUCTION.

The total tonnage produced by the coal-mines of the Province for the year ended December 31st, 1927, was 2,453,827 tons, being an increase of 123,791 tons or 5.31 per cent. above production of 1926.

The Coast District, which includes Vancouver Island, Nicola-Princeton, and Northern District, produced 1,546,308 tons, an increase of 64,720 tons or 4.30 per cent. above 1926.

Vancouver Island collieries produced during 1927 1,331,325 tons, an increase of 38,150 tons or 2.95 per cent. over 1926.

The Northern District produced 1,691 tons, or an increase of 431 tons compared with 1926.

Nicola-Princeton District produced 213,292 tons, an increase of 26,139 tons or 13.96 per cent. over 1926.

East Kootenay District produced 907,519 tons, an increase of 59,071 tons or 6.96 per cent. over 1926.

The coal companies producing during the year were: The Crow's Nest Pass Coal Company and Corbin Coal Company in the East Kootenay District; the Coalmont Collieries, Middlesboro Collieries, Tulameen Valley Coal Company, the Southern Okanagan Collieries, and Lynden Coal Mine, Limited, in the Nicola-Princeton District; Telkwa Collieries in the Northern District; and the Western Fuel Corporation of Canada, Limited, Canadian Collieries (Dunsmuir), Limited, Granby Consolidated Mining, Smelting, and Power Company, Limited, East Wellington Coal Company, and the King & Foster Coal Company (the latter is now operated by the Canadian Collieries as No. 9 mine, Wellington Extension) on Vancouver island.

A considerable amount of prospecting and exploratory work has been carried out in the Nicola-Princeton District, both by actual mining and by diamond-drilling.

On Vancouver island the Canadian Collieries (Dunsmuir), Limited, at the Wellington Extension Colliery has opened mines, on a small scale as yet, at two different parts of the property.

During the year two small operations were started—one at South Wellington, known as Fiddick's mine, and the other at Nanoose, known as the Diamond Jubilee mine.

The following table shows the output and *per capita* production daily and for the year of the various mines:—

| Colliery and Mine. | Gross Tons of Coal mined during Year. | Days worked. | Total No. of Employees. | Tons of Coal mined per Employee daily. | Tons of Coal mined per Employee for Year. | No. of Employees Underground. | Tons of Coal mined per Underground Employee daily. | Tons of Coal mined per Underground Employee for Year. |
|---|---|---|---|---|---|---|---|---|
| Nanaimo— | | | | | | | | |
| No. 1 mine | 347,283 | 271 | 732 | 1.74 | 474 | 515 | 2.48 | 674 |
| Reserve mine | 176,576 | 256 | 349 | 1.97 | 506 | 219 | 3.15 | 806 |
| Wakesiah mine | 47,119 | 168 | 159 | 1.75 | 296 | 108 | 2.74 | 436 |
| South Wellington, No. 5 | 73,762 | 279 | 145 | 1.78 | 508 | 112 | 2.33 | 658 |
| Extension Colliery | 207,837 | 292 | 637 | 1.11 | 326 | 449 | 1.58 | 462 |
| Wellington, No. 9 | 5,643 | 83 | 116 | 0.57 | 48 | 75 | 0.89 | 75 |
| Comox Colliery | 233,894 | 267 | 576 | 1.52 | 406 | 440 | 1.98 | 531 |
| King & Foster Coal Co.* | 546 | 12 | 72 | 0.58 | 7 | 47 | 0.91 | 11 |
| East Wellington Coal Co | 47,454 | 269 | 137 | 1.28 | 346 | 106 | 1.66 | 447 |
| Granby Consolidated M.S. & P. Co. | 190,653 | 296 | 233 | 2.76 | 818 | 172 | 3.74 | 1,108 |
| Diamond Jubilee mine | 282 | 97 | 4 | 0.72 | 70 | 3 | 0.97 | 94 |
| Fiddick mine | 276 | 48 | 3 | 1.91 | 92 | 2 | 2.87 | 138 |
| Middlesboro Collieries, Ltd. | 42,945 | 239 | 115 | 1.56 | 373 | 83 | 2.16 | 517 |
| Coalmont Collieries, Ltd. | 152,595 | 286 | 350 | 1.52 | 436 | 227 | 2.35 | 672 |
| Tulameen Valley Coal Co. | 14,406 | 254 | 42 | 1.35 | 343 | 22 | 2.57 | 655 |
| Southern Okanagan Collieries | 576 | 309 | 4 | 0.46 | 144 | 3 | 0.62 | 192 |
| Lynden Valley Coal Mine, Ltd. | 2,770 | 117 | 44 | 0.53 | 63 | 19 | 1.24 | 145 |
| Telkwa Collieries, Ltd. | 1,671 | 199 | 9 | 0.93 | 185 | 7 | 1.24 | 238 |
| Coal Creek Colliery | 420,706 | 250½ | 708 | 2.29 | 594 | 519 | 3.13 | 810 |
| Michel Colliery | 356,696 | 248½ | 609 | 2.35 | 585 | 399 | 3.21 | 899 |
| Corbin Coals, Ltd. | 130,117 | 289 | 177 | 2.54 | 735 | 115 | 3.91 | 1,131 |

* King & Foster Coal Co., Ltd., closed down in January, 1927.

### Collieries of Vancouver Island Inspection District.

The output of Vancouver Island collieries was 1,331,325 tons. Of this amount, 149,801 tons or 11.2 per cent. was lost in preparation for the market; 121,541 tons or 9.1 per cent. was consumed by producing companies as fuel; and 1,040,431 tons or 78.1 per cent. was sold in the competitive markets.

Of the amount sold in the competitive markets, 935,396 tons or 89.9 per cent. of the amount sold and nearly 70.2 per cent. of the total output mined was sold in Canada, and 105,035 tons or 10.1 per cent. of the amount sold and 7.8 per cent. of the total amount mined was sold in the United States.

### Collieries of Nicola-Princeton Inspection District.

Of the gross output of 213,292 tons produced by collieries of the Nicola-Princeton District, 14,193 tons or 6.6 per cent. was consumed by producing companies as fuel, and 199,145 tons or over 93 per cent. was sold in the competitive markets.

Of the amount sold in competitive markets, 198,611 tons or 99.7 per cent. of the amount sold and nearly 93.1 per cent. of the total amount mined was sold in Canada, and 534 tons or 0.26 per cent. of the amount sold and about 0.25 per cent. of the total amount mined was sold in the United States.

### Collieries of the East Kootenay Inspection District.

Of the gross output of 907,519 tons produced by the collieries of the East Kootenay District, 55,429 tons or 6.1 per cent. was consumed as fuel, 129,933 tons or 14.3 per cent. was made into coke, and 717,473 tons or 79 per cent. was sold in the competitive markets. Of the amount sold in the competitive markets, 445,478 tons or 63.4 per cent. of the amount sold and 49 per cent. of the total output was sold in Canada, and 271,995 tons or 36.6 per cent. of the amount sold and 29.9 per cent. of the total output was sold in the United States.

The following table shows for the past twelve years the output and the *per capita* production of the various districts:—

OUTPUT AND PER CAPITA PRODUCTION OF VARIOUS DISTRICTS.

| Year. | District. | Gross Tons of Coal mined during Year. | Total No. of Employees at Producing Collieries. | Tons of Coal mined per Employee for Year. | No. of Men employed Underground in Producing Collieries. | Tons of Coal mined per Underground Employee for Year. |
|---|---|---|---|---|---|---|
| 1916 | East Kootenay District | 882,270 | 1,674 | 527 | 1,125 | 784 |
| | Coast District | 1,603,310 | 3,386 | 474 | 2,569 | 624 |
| | Whole Province | 2,485,580 | 5,060 | 491 | 3,694 | 673 |
| 1917 | East Kootenay District | 551,751 | 1,481 | 372 | 944 | 584 |
| | Coast District | 1,846,964 | 3,689 | 501 | 2,816 | 656 |
| | Whole Province | 2,398,715 | 5,170 | 463 | 3,760 | 638 |
| 1918 | East Kootenay District | 732,864 | 1,327 | 552 | 814 | 900 |
| | Coast District | 1,845,860 | 4,100 | 450 | 2,844 | 645 |
| | Whole Province | 2,578,724 | 5,427 | 475 | 3,658 | 705 |
| 1919 | East Kootenay District | 558,806 | 1,369 | 409 | 1,000 | 559 |
| | Coast District | 1,850,142 | 4,597 | 402 | 3,145 | 588 |
| | Whole Province | 2,408,948 | 5,966 | 404 | 4,145 | 581 |
| 1920 | East Kootenay District | 847,389 | 1,582 | 536 | 1,062 | 798 |
| | Coast District | 1,849,385 | 4,767 | 388 | 3,129 | 591 |
| | Whole Province | 2,696,774 | 6,349 | 425 | 4,191 | 643 |
| 1921 | East Kootenay District | 759,755 | 1,774 | 428 | 1,207 | 629 |
| | Coast District | 1,809,884 | 5,111 | 354 | 3,515 | 515 |
| | Whole Province | 2,569,639 | 6,885 | 373 | 4,722 | 544 |
| 1922 | East Kootenay District | 554,361 | 1,538 | 360 | 1,063 | 521 |
| | Coast District | 2,026,554 | 5,106 | 396 | 3,649 | 551 |
| | Whole Province | 2,580,915 | 6,644 | 388 | 4,712 | 547 |
| 1923 | East Kootenay District | 740,531 | 1,434 | 516 | 965 | 767 |
| | Coast District | 1,802,456 | 4,715 | 395 | 3,377 | 546 |
| | Whole Province | 2,542,987 | 6,149 | 413 | 4,342 | 585 |
| 1924 | East Kootenay District | 273,518 | 1,147 | 238 | 797 | 343 |
| | Coast District | 1,714,015 | 4,271 | 401 | 3,097 | 553 |
| | Whole Province | 1,987,533 | 5,418 | 366 | 3,894 | 510 |
| 1925 | East Kootenay District | 854,480 | 1,466 | 582 | 989 | 864 |
| | Coast District | 1,589,812 | 3,977 | 399 | 2,839 | 559 |
| | Whole Province | 2,444,292 | 5,443 | 449 | 3,828 | 639 |
| 1926 | East Kootenay District | 848,448 | 1,431 | 592 | 962 | 881 |
| | Coast District | 1,481,588 | 3,891 | 380 | 2,795 | 530 |
| | Whole Province | 2,330,036 | 5,322 | 437 | 3,757 | 620 |
| 1927 | East Kootenay District | 907,519 | 1,494 | 607 | 1,033 | 876 |
| | Coast District | 1,546,308 | 3,731 | 414 | 2,613 | 592 |
| | Whole Province | 2,453,827 | 5,225 | 469 | 3,646 | 673 |

The following table shows the production and distribution of coal by the various collieries and districts, compiled from returns furnished by the owners:—

## Collieries of British Columbia—Production, 1927.

| Mine. | Sold. | | | Total Sales. | Lost in Washing. | Used in making Coke. | Used under Co.'s Boilers, etc. | Total for Colliery Use. | Stocks. | | Difference. | | Output for Year 1927. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | In Canada. | In U.S.A. | Elsewhere. | | | | | | First of Year. | Last of Year. | Added to. | Taken from. | |
| *Vancouver Island.* | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons (2,240lb). |
| Canadian Collieries (D.), Ltd.— | | | | | | | | | | | | | |
| South Wellington | 53,006 | ..... | ..... | 53,006 | 15,876 | ..... | 4,880 | 20,756 | ..... | ..... | ..... | ..... | 73,762 |
| Extension | 115,014 | 41,076 | ..... | 156,090 | 30,897 | ..... | 15,969 | 46,866 | 6,611 | 11,492 | 4,881 | ..... | 207,837 |
| No. 9 mine | 4,917 | ..... | ..... | 4,917 | 436 | ..... | 290 | 726 | ..... | ..... | ..... | ..... | 5,643 |
| Comox | 196,251 | 2,214 | ..... | 198,465 | 24,451 | ..... | 4,579 | 29,030 | 2,560 | 8,959 | 6,399 | ..... | 233,894 |
| Western Fuel Corporation of Canada, Ltd.— | | | | | | | | | | | | | |
| No. 1, Nanaimo | 241,767 | 32,820 | ..... | 274,587 | 19,792 | ..... | 49,594 | 69,386 | 15,024 | 18,334 | 3,310 | ..... | 347,283 |
| Reserve mine | 129,232 | 17,543 | ..... | 146,775 | 16,831 | ..... | 11,197 | 28,028 | 6,642 | 8,415 | 1,773 | ..... | 176,576 |
| Wakesiah mine | 27,816 | 3,776 | ..... | 31,592 | 2,089 | ..... | 14,190 | 16,279 | 3,739 | 2,987 | ..... | 752 | 47,119 |
| King & Foster Coal Co., Ltd | 546 | ..... | ..... | 546 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 546 |
| East Wellington Coal Co., Ltd | 38,072 | ..... | ..... | 38,072 | 1,074 | ..... | 8,279 | 9,353 | ..... | 29 | 29 | ..... | 47,454 |
| Granby Cons. M. S. & P. Co., Ltd | 128,217 | 7,606 | ..... | 135,823 | 38,355 | ..... | 12,563 | 50,918 | 2,580 | 6,492 | 3,912 | ..... | 190,653 |
| Diamond Jubilee mine | 282 | ..... | ..... | 282 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 282 |
| Fiddick mine | 276 | ..... | ..... | 276 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 276 |
| Totals, Vancouver Island | 935,396 | 105,035 | ..... | 1,040,431 | 149,801 | ..... | 121,541 | 271,342 | 37,156 | 56,708 | 20,304 | 752 | 1,331,325 |
| *Nicola-Princeton District.* | | | | | | | | | | | | | |
| Middlesboro Collieries, Ltd | 40,970 | ..... | ..... | 40,970 | ..... | ..... | 2,037 | 2,037 | 241 | 179 | ..... | 62 | 42,945 |
| Coalmont Collieries, Ltd | 141,402 | ..... | ..... | 141,402 | ..... | ..... | 11,193 | 11,193 | ..... | ..... | ..... | ..... | 152,595 |
| Tulameen Valley Coal Co., Ltd | 13,677 | ..... | ..... | 13,677 | ..... | ..... | 713 | 713 | ..... | 16 | 16 | ..... | 14,406 |
| Southern Okanagan Collieries, Ltd | 481 | 95 | ..... | 576 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 576 |
| Lynden Coal Mines, Ltd | 2,081 | 439 | ..... | 2,520 | ..... | ..... | 250 | 250 | ..... | ..... | ..... | ..... | 2,770 |
| Totals, Nicola-Princeton District | 198,611 | 534 | ..... | 199,145 | ..... | ..... | 14,193 | 14,193 | 241 | 195 | 16 | 62 | 213,292 |
| *Northern District.* | | | | | | | | | | | | | |
| Telkwa Collieries, Ltd | 1,671 | ..... | ..... | 1,671 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,671 |
| Canadian National Anthracite Syndicate | 20 | ..... | ..... | 20 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 20 |
| Totals, Northern District | 1,691 | ..... | ..... | 1,691 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,691 |
| Grand totals, Coast District | 1,135,698 | 105,569 | ..... | 1,241,267 | 149,801 | ..... | 135,734 | 285,535 | 37,397 | 56,903 | 20,320 | 814 | 1,546,308 |
| *East Kootenay District.* | | | | | | | | | | | | | |
| Crow's Nest Pass Coal Co., Ltd.— | | | | | | | | | | | | | |
| Coal Creek Colliery | 102,814 | 239,502 | ..... | 342,316 | ..... | 48,300 | 30,633 | 78,933 | 745 | 202 | ..... | 543 | 420,706 |
| Michel Colliery | 258,724 | ..... | ..... | 258,724 | ..... | 81,633 | 16,339 | 97,972 | ..... | ..... | ..... | ..... | 356,696 |
| Corbin Coals, Ltd | 83,940 | 32,493 | ..... | 116,433 | ..... | ..... | 8,457 | 8,457 | 27,732 | 32,959 | 5,227 | ..... | 130,117 |
| Totals, East Kootenay District | 445,478 | 271,995 | ..... | 717,473 | ..... | 129,933 | 55,429 | 185,362 | 28,477 | 33,161 | 5,227 | 543 | 907,519 |
| *Coal.* | | | | | | | | | | | | | |
| Grand total for Province | 1,581,176 | 377,564 | ..... | 1,958,740 | 149,801 | 129,933 | 191,163 | 470,897 | 65,874 | 90,064 | 25,547 | 1,357 | 2,453,827 |

## Collieries of British Columbia—Men employed, 1927.

| Mine. | White Men. | | | | | | | | | | | | | | | | Indians. | | | Japanese and Chinese. | | | | | | | | | Total Men employed. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Supervision and Clerical. | | | Miners. | | | Helpers. | | | Labourers. | | | Mechanics and Skilled Labour. | | | Boys. | | | Labourers. | | | Miners. | | | Helpers. | | | Labourers. | | | | | |
| | U. | A. | T. | U. | A. | T. | U. | A. | T. | U. | A. | T. | U. | A. | T. | U. | A. | T. | U. | A. | T. | U. | A. | T. | U. | A. | T. | U. | A. | T. | U. | A. | T. |
| *Vancouver Island.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Canadian Collieries (D.), Ltd.— | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| South Wellington | 5 | .. | 5 | 72 | .. | 72 | .. | .. | .. | 30 | 18 | 48 | 5 | 5 | 10 | .. | 10 | 10 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 112 | 33 | 145 |
| Extension | 21 | 13 | 34 | 299 | .. | 299 | 13 | .. | 13 | 93 | 30 | 123 | 17 | 61 | 78 | .. | 16 | 16 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 6 | 68 | 74 | 449 | 188 | 637 |
| No. 9 mine | 3 | 2 | 5 | 51 | .. | 51 | 2 | .. | 2 | 17 | 26 | 43 | 2 | 11 | 13 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 | 2 | 75 | 41 | 116 |
| Comox | 23 | 14 | 37 | 88 | .. | 88 | .. | .. | .. | 32 | 40 | 72 | 65 | 53 | 118 | 7 | 9 | 16 | .. | .. | .. | 97 | .. | 97 | 75 | .. | 75 | 53 | 20 | 73 | 440 | 136 | 576 |
| Western Fuel Corp. of Canada, Ltd.— | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 56 | 56 | 515 | 217 | 732 |
| No. 1, Nanaimo | 28 | 23 | 51 | 171 | .. | 171 | .. | .. | .. | 199 | 64 | 263 | 90 | 54 | 144 | 26 | 19 | 45 | 1 | 1 | 2 | .. | .. | .. | .. | .. | .. | .. | 42 | 42 | 219 | 130 | 349 |
| Reserve | 10 | 12 | 22 | 106 | .. | 106 | 4 | .. | 4 | 64 | 33 | 97 | 20 | 32 | 52 | 14 | 11 | 25 | 1 | .. | 1 | . | .. | . | .. | .. | .. | .. | 12 | 12 | 108 | 51 | 159 |
| Wakesiah | 7 | 7 | 14 | 58 | .. | 58 | 2 | .. | 2 | 26 | 13 | 39 | 8 | 13 | 21 | 7 | 6 | 13 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 47 | 25 | 72 |
| King & Foster Coal Co., Ltd | 3 | 3 | 6 | 31 | .. | 31 | .. | .. | .. | 12 | 16 | 28 | .. | 6 | 6 | 1 | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 11 | 11 | 106 | 31 | 137 |
| East Wellington Coal Co., Ltd | 2 | 3 | 5 | 44 | .. | 44 | .. | .. | .. | 39 | 4 | 43 | 15 | 7 | 22 | 6 | 6 | 12 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 172 | 61 | 233 |
| Granby C. M. S. & P. Co., Ltd.—Cassidy | 5 | 8 | 13 | 108 | .. | 108 | .. | .. | .. | 59 | 26 | 85 | .. | 22 | 22 | .. | 5 | 5 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 3 | 1 | 4 |
| Diamond Jubilee mine | .. | 1 | 1 | 3 | .. | 3 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 | 1 | 3 |
| Fiddick mine | .. | .. | .. | 2 | .. | 2 | .. | .. | .. | .. | 1 | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Totals, Vancouver Island | 107 | 86 | 193 | 1033 | .. | 1033 | 21 | .. | 21 | 571 | 271 | 842 | 222 | 264 | 486 | 61 | 82 | 143 | 2 | 1 | 3 | 97 | .. | 97 | 75 | .. | 75 | 59 | 211 | 270 | 2248 | 915 | 3,163 |
| *Nicola-Princeton District.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Middlesboro Collieries, Ltd | 7 | 3 | 10 | 40 | .. | 40 | 16 | .. | 16 | 20 | 12 | 32 | .. | 12 | 12 | .. | 5 | 5 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | 1 | 83 | 32 | 115 |
| Coalmont Collieries, Ltd | 14 | 13 | 27 | 147 | .. | 147 | .. | .. | .. | 62 | 76 | 138 | 1 | 31 | 32 | 3 | 2 | 5 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 227 | 123 | 350 |
| Tulameen Valley Coal Co., Ltd | 1 | 4 | 5 | 7 | .. | 7 | 7 | .. | 7 | 5 | 10 | 15 | 2 | 4 | 6 | .. | 2 | 2 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 22 | 20 | 42 |
| Southern Okanagan Collieries, Ltd | 1 | .. | 1 | 2 | .. | 2 | .. | .. | .. | .. | 1 | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 3 | 1 | 4 |
| Lynden Coal Mines, Ltd | 3 | 3 | 6 | 14 | .. | 14 | 2 | . | 2 | .. | 15 | 15 | .. | 7 | 7 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 19 | 25 | 44 |
| Totals, Nicola-Princeton District | 26 | 23 | 49 | 210 | .. | 210 | 25 | .. | 25 | 87 | 114 | 201 | 3 | 54 | 57 | 3 | 9 | 12 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | 1 | 354 | 201 | 555 |
| *Northern District.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Telkwa Collieries, Ltd | . | .. | .. | 5 | .. | 5 | 2 | .. | 2 | .. | 1 | 1 | .. | 1 | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 7 | 2 | 9 |
| Canadian National Anthracite, Synd | . | .. | .. | 4 | .. | 4 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 4 | .. | 4 |
| Totals, Northern District | .. | .. | .. | 9 | .. | 9 | 2 | .. | 2 | .. | 1 | 1 | .. | 1 | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 11 | 2 | 13 |
| Grand totals, Coast District | 133 | 109 | 242 | 1252 | .. | 1252 | 48 | .. | 48 | 658 | 386 | 1044 | 225 | 319 | 544 | 64 | 91 | 155 | 2 | 1 | 3 | 97 | .. | 97 | 75 | .. | 75 | 59 | 212 | 271 | 2613 | 1118 | 3,731 |
| *East Kootenay District.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Crow's Nest Pass Coal Co., Ltd.— | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 519 | 189 | 708 |
| Coal Creek Colliery | 22 | 12 | 34 | 251 | .. | 251 | .. | .. | .. | 45 | 51 | 96 | 190 | 115 | 305 | 11 | 11 | 22 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 399 | 210 | 609 |
| Michel Colliery | 18 | 10 | 28 | 205 | .. | 205 | .. | .. | .. | 31 | 78 | 109 | 122 | 112 | 234 | 23 | 10 | 33 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 115 | 62 | 177 |
| Corbin Coals, Ltd | 8 | 11 | 19 | 65 | .. | 65 | 12 | .. | 12 | 21 | 23 | 44 | 9 | 25 | 34 | .. | 3 | 3 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1033 | 461 | 1,494 |
| Totals, East Kootenay District | 48 | 33 | 81 | 521 | .. | 521 | 12 | .. | 12 | 97 | 152 | 249 | 321 | 252 | 573 | 34 | 24 | 58 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 3646 | 1579 | 5,225 |
| Grand totals for Province | 181 | 142 | 323 | 1773 | .. | 1773 | 60 | .. | 60 | 755 | 538 | 1293 | 546 | 571 | 1117 | 98 | 115 | 213 | 2 | 1 | 3 | 97 | .. | 97 | 75 | .. | 75 | 59 | 212 | 271 | | | |

Note.—U = underground; A = above ground; T = total.

## LABOUR AND EMPLOYMENT.

During the year 1927 there were 5,225 persons employed in and about the coal-mines of the Province, a decrease of about 1.8 per cent. as compared with 1926.

The collieries of the Province were entirely free from labour disputes during the year, the only time lost being through lack of trade.

Apart from the regular holidays, the mines in Vancouver Island District lost about 12 per cent. of the working-days through lack of trade.

In the Nicola-Princeton District the different collieries worked from 79 to 95 per cent. of the working-days, averaging for the district about 90 per cent. of the working-days.

The mines in the East Kootenay District worked from 82 per cent. at the lowest to 96 per cent. at the highest of the working-days during the year, and worked for an average for the whole district about 87 per cent. of the time.

The table on page 373 shows the number of persons ordinarily employed in and about the mines, distinguishing the persons and different classes employed underground and above ground, compiled from returns furnished by the owners as required by section 66 of the "Coal-mines Regulation Act."

## FUEL-OIL COMPETITION.

The importation of fuel-oil for use in British Columbia amounted to 48,861,000 gallons in 1927, as compared with 62,214,000 gallons in 1926, a decrease of 21.5 per cent.

The above figures do not include crude petroleum imported for refining purposes, nor fuel-oil ex-warehoused for shipping.

(Above figures supplied by Customs Department, Ottawa.)

## ACCIDENTS IN AND AROUND COAL-MINES.

During 1927 there were 5,225 persons employed in and around the coal-mines. Eleven fatal accidents occurred during the year, as compared with ten for 1926.

The ratio of fatal accidents per 1,000 persons employed was 2.10, as compared with 1.88 in 1926; in 1925 the ratio was 1.10; in 1924, 1.66; in 1923, 7.32; in 1922, 4.66; in 1921, 1.45; in 1920, 2.67; in 1919, 2.10; in 1918, 5.15; the average for the ten-year period being 3.01. The number of fatal accidents per 1,000,000 tons produced during 1927 was 4.48. During 1926 the fatalities per 1,000,000 tons of coal mined was 4.3; in 1925, 2.45; in 1924, 4.52; in 1923, 1.76; in 1922, 12.01; in 1921, 3.98; in 1920, 6.30; in 1919, 4.98; in 1918, 10.86; the average for the ten-year period being 7.14 per 1,000,000 tons of coal mined.

The following table shows the collieries at which the fatal accidents occurred during 1927 and comparative figures for 1926:—

| Name of Company. | Name of Colliery. | 1927. | 1926. |
|---|---|---|---|
| Canadian Collieries (D.), Ltd. | Comox, No. 4 mine | 1 | 1 |
| Wstern Fuel Corporation, Ltd. | Wakesiah mine | 1 | .... |
| Wstern Fuel Corporation, Ltd. | Reserve mine | .... | 2 |
| Wstern Fuel Corporation, Ltd. | No. 1 mine | 2 | .... |
| Granby Consolidated M.S. & P. Co., Ltd. | Cassidy, No. 1 | 3 | 4 |
| East Wellington Coal Co. | No. 1 mine | .... | 1 |
| Coalmont Collieries, Ltd. | No. 4 mine | 1 | .... |
| Crow's Nest Pass Coal Co., Ltd. | Coal Creek | 1 | 1 |
| Crow's Nest Pass Coal Co., Ltd. | Michel | .... | 1 |
| Corbin Coals, Ltd. | No. 6 mine | 2 | .... |
| Totals | | 11 | 10 |

In addition to above, an elderly surface labourer died a few days after receiving slight superficial injuries at Michel Colliery.

The following table shows the various causes of fatal accidents and their percentage of the whole, with corresponding figures for 1926:—

| Cause. | 1927. | | 1926. | |
|---|---|---|---|---|
| | No. | Per Cent. | No. | Per Cent. |
| Falls of rock | 3 | 27.27 | 3 | 30.00 |
| Falls of coal | 4 | 36.37 | 1 | 10.00 |
| Blow-outs of gas and material | .... | ..... | 3 | 30.00 |
| Mine-cars and haulage | 2 | 18.18 | 2 | 20.00 |
| Miscellaneous (underground) | .... | ..... | 1 | 10.00 |
| Explosion of fire-damp | 2 | 18.18 | .... | ..... |
| Totals | 11 | 100.00 | 10 | 100.00 |

The following table shows the number of tons of coal mined for each fatal accident in their respective classes in the years 1927 and 1926:—

| Cause. | 1927. | | 1926. | |
|---|---|---|---|---|
| | No. of Fatal Accidents. | No. of Tons of Coal mined per Fatal Accident. | No. of Fatal Accidents. | No. of Tons of Coal mined per Fatal Accident. |
| Falls of rock | 3 | 817,942 | 3 | 776,665 |
| Falls of coal | 4 | 613,456 | 1 | 2,329,996 |
| Blow-outs of gas and material | .... | ..... | 2 | 1,164,998 |
| Mine-cars and haulage | 2 | 1,226,913 | 3 | 776,665 |
| Miscellaneous (underground) | .... | ..... | 1 | 2,329,996 |
| Explosion of fire-damp | 2 | 1,226,913 | .... | 1,164,998 |
| Totals | 11 | 223,075 | 10 | 232,999 |

The number of tons mined per fatal accident during 1927 was 223,075 tons, compared with 232,999 tons for 1926. The average for the last ten years was 137,400 tons.

The following table shows the fatalities from various causes in coal-mines during the year 1927 and comparisons with 1926, according to Inspection Districts:—

| District. | Number of Deaths from Accidents. | | | | | | Total. | | Accident Death-rate. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Explosions of Fire-damp. | Falls of Ground. | Shaft Accidents. | Haulage and Mine-cars. | Miscellaneous (Underground). | On Surface. | 1927. | 1926. | Per 1,000 Persons employed. | | Per 1,000,000 Tons of Coal mined. | |
| | | | | | | | | | 1927. | 1926. | 1927. | 1926. |
| Vancouver Island | .... | 5 | .... | 2 | .... | .... | 7 | 8 | 2.21 | 2.35 | 5.25 | 6.18 |
| Nicola-Princeton | .... | 1 | .... | .... | .... | .... | 1 | .... | 1.80 | ..... | 4.68 | ..... |
| East Kootenay | 2 | 1 | .... | .... | .... | .... | 3 | 2 | 2.67 | 1.39 | 3.30 | 2.35 |
| Northern | .... | .... | .... | .... | .... | .... | .... | .... | ..... | ..... | ..... | ..... |
| Province (1927) | 2 | 7 | .... | 2 | .... | .... | 11 | .... | 2.10 | ..... | 4.48 | ..... |
| Province (1926) | .... | 4 | 3 | 2 | 1 | .... | .... | 10 | ..... | 1.88 | ..... | 4.29 |

The following table shows the ratio of accidents per 1,000 employees and per 1,000,000 tons of coal mined in the Coast and East Kootenay Inspection Districts for the ten-year period ended December 31st, 1927:—

| District. | No. of Fatalities. | Accident Death-rate. | |
|---|---|---|---|
| | | Per 1,000 Employees. | Per 1,000,000 Tons of Coal mined. |
| Coast | 160 | 3.6 | 9.1 |
| East Kootenay | 19 | 1.3 | 2.6 |
| For Province | 179 | 3.0 | 7.2 |

The details surrounding the occurrence of the fatal accidents in coal-mines during 1927 are as follows:—

The fatal accident which occurred to John F. Weber, fireboss, Wakesiah mine, on January 13th was caused by suffocation. The district in which the accident occurred was not being worked on this shift and Weber had been instructed to assist the fireboss in another district by firing shots. For some undetermined reason Weber had gone into the idle district and had gone into a face where pillar-extraction was, normally, being carried on. It was several hours before his disappearance was noted, and on search being made he was found dead beneath some loose debris which had been disturbed at the above face.

The fatal accident which occurred to Leon Carles, miner, No. 1 mine, Western Fuel Corporation of Canada, Limited, on January 26th was due to a fall of coal and rock in his working-place. This place was being driven to the rise on a pitch of about 20° and on the above date a shot had been fired at the face. On the shotfirer returning to examine the place after the shot had been fired, Carles had followed him at an interval of a few yards. Before the shotfirer had time to examine the place a large boulder of rock and coal fell and rolled a short distance past him and pinned Carles against a post, with fatal results.

The fatal accident which occurred to William Orme, brusher, No. 1 mine, Western Fuel Corporation of Canada, Limited, on February 19th was caused by a fall of coal and rock a short time after a brushing-shot had been fired for him.

The fatal accident to Fred Zenovich, rope-rider, No. 1 East mine, Coal Creek Colliery, was caused by a cave of fine coal which smothered him. Zenovich was riding a trip of empty cars down a slope and, due to a misunderstanding, the trip was deflected into a level at full speed, causing the cars to be derailed and strike the timbering, some of which was displaced and allowed the coal-rashing to fall. It was part of Zenovich's duty to attend to the switches and direct the speed and destination of the trips.

The fatal accident which occurred to Nestor Alton, miner, No. 1 mine, Granby Consolidated Mining, Smelting, and Power Company, Cassidy, was due to a fall of rock in his working-place. Alton and his partner were engaged in pillar-extraction and had their place apparently well timbered. A sudden roof movement displaced some timbers and broke others, allowing a cave of large rock; same being about 50 tons. All the timber in the immediate vicinity was fresh and had been in position only several days prior to the accident.

The fatal accident to Hugh McReynolds occurred at the entrance of No. 5 North level, No. 1 mine, Granby Consolidated Mining, Smelting, and Power Company, Cassidy, on August 22nd, and was due to deceased being crushed between a derailed trip of empty cars going down the Main slope and a prop. McReynolds had carried some tools out to the slope for service in another part of the mine and while waiting to communicate with the rope-rider in charge of the trip the accident happened. There was a telephone that should have been used for this purpose within a few feet from the place where McReynolds was crushed.

The fatal accident to William James occurred in No. 4 mine, Coalmont Colliery, on September 27th, and was caused by fall of coal at the working-face. Mr. James was an experienced miner and had at different times held important positions in mining.

The fatal accident which occurred to William Wanhella, miner, No. 6 mine, Corbin Colliery, on October 1st was due to an explosion of gas in the section where he was at work. He had either fallen down, or been blown down, a ladderway and instantly killed.

The fatal accident which occurred to Thomas Radcliffe, fireboss, No. 6 mine, Corbin Colliery, was due to an explosion of gas. Radcliffe was injured by an explosion on October 1st and died as a result of his injuries on October 3rd. Same accident as above. (*See* details under "Explosions.")

The fatal accident which occurred to T. Tateishi, Japanese, miner, No. 4 mine, Comox Colliery, on October 5th was due to a fall of top coal which knocked deceased against a cog and broke his neck. He died on October 7th as a result of his injuries.

The fatal accident which occurred to Charles Bell, switcher, in Granby Consolidated Mining, Smelting, and Power Company's No. 1 mine at Cassidy on December 13th was due to deceased being crushed between a car and a post. Deceased was riding on an empty trip and had swung himself to one side in order to hold the cars down while on a curve. His body projected beyond the cars and was caught by the timbers supporting the roof, with fatal results.

## EXPLOSIVES.

The following table shows the quantity of explosives used in coal-mines during 1927, together with number of shots fired, how shots were fired, tons of coal produced per pound explosive used, and the average pounds of explosive per shot fired (these quantities include all explosives used for breaking coal and for rock-work in coal-mines) :—

### Vancouver Island District.

| Colliery and Mine. | Quantity of Explosive used in Pounds. | Tonnage for Mine. | Total No. of Shots fired. | Tons of Coal per Pound of Explosive used. | Average Pounds of Explosive per Shot fired. |
|---|---|---|---|---|---|
| No. 1 mine, Nanaimo | 72,598 | 347,283 | 113,640 | 4.78 | 0.64 |
| Reserve mine, Nanaimo | 61,869 | 176,576 | 90,543 | 2.04 | 0.68 |
| Wakesiah mine, Nanaimo | 22,744 | 47,119 | 29,636 | 2.07 | 0.76 |
| Wellington Extension Colliery | 135,467 | 287,242 | 159,204 | 2.12 | 0.85 |
| Comox Colliery | 34,226 | 233,894 | 30,601 | 6.83 | 1.12 |
| King & Foster Coal Co. | ..... | ..... | ..... | ..... | ..... |
| East Wellington Coal Co. | 16,719 | 47,454 | 27,879 | 2.85 | 0.60 |
| Cranby Consolidated M.S. & P. Co. | 10,794 | 190,653 | 8,926 | 17.66 | 1.21 |
| Diamond Jubilee mine | 720 | 282 | 400 | 0.39 | 1.80 |
| Fiddick mine | 150 | 276 | 225 | 1.84 | 0.67 |
| Total for district | 355,287 | 1,330,779 | 461,054 | 3.74 | 0.77 |

### Nicola-Princeton District.

| | | | | | |
|---|---|---|---|---|---|
| Middlesboro Collieries | 11,250 | 42,945 | 20,350 | 3.81 | 0.55 |
| Coalmont Collieries | 49,804 | 152,595 | 64,900 | 3.06 | 0.77 |
| Tulameen Valley Coal Co. | 3,603 | 14,406 | 4,804 | 3.99 | 0.75 |
| Southern Okanagan Colliery | 200 | 576 | 500 | 2.88 | 0.40 |
| Lynden Coal Mines, Ltd. | 1,000 | 2,770 | 1,500 | 2.77 | 0.67 |
| Total for district | 65,857 | 213,292 | 92,054 | 3.23 | 0.72 |

### Northern District.

| | | | | | |
|---|---|---|---|---|---|
| Telkwa Collieries, Ltd. | 650 | 1,671 | 726 | 2.57 | 0.90 |

### East Kootenay District.

| | | | | | |
|---|---|---|---|---|---|
| Coal Creek Colliery | 4,413 | 420,706 | 3,566 | 95.35 | 1.24 |
| Michel Colliery | 58,855 | 356,696 | 49,123 | 6.06 | 1.16 |
| Corbin Colliery | 13,919 | 130,117 | 11,033 | 9.34 | 1.26 |
| Total for district | 77,187 | 907,519 | 63,722 | 11.74 | 1.21 |
| Total for Province | 498,981 | 2,453,261 | 617,556 | 4.91 | 0.81 |

| Quantities of Different Explosives used. | Lb. |
|---|---|
| Monobels of different grades | 410,718 |
| Miner's Friend | 4,974 |
| CXLite | 209 |
| Gelpermite | 81,980 |
| Stumping-powder | 1,100 |
| Total | 498,981 |

The following is a list of explosives permitted for use in coal-mines by the Honourable the Minister of Mines under the provisions of section 101, General Rule 11, clause (2), "Coal-mines Regulation Act":—

Nobel Monobel.
Polar Monobel No. 3.
Polar Monobel No. 4.
Polar Monobel No. 6.
Coalite "C" L.F.
Miner's Friend No. 6.
Miner's Friend No. 9.
Polar CXLite
Gelpermite No. 1.

## MACHINE-MINED COAL.

During the year 1927 mining-machines produced 168,846 tons of coal or 6.8 per cent. of the total. Of the total machine-mined coal, Vancouver Island District produced 136,363 tons or 80.7 per cent., and Nicola-Princeton District 32,483 tons or 19.3 per cent.

The following tables give the district, number of machines, how driven, tons of coal produced, and type of machine used:—

| District. | Number driven by | | Total Tons (2,240 lb.). |
|---|---|---|---|
| | Electricity. | Compressed Air. | |
| Vancouver Island | 1 | 20 | 136,363 |
| Nicola-Princeton | .... | 9 | 32,483 |
| East Kootenay | .... | .... | ..... |
| Northern | .... | .... | ..... |
| Totals | 1 | 29 | 168,846 |

Types of Machines in Use.

| Type. | Districts. | | | | Total. |
|---|---|---|---|---|---|
| | East Kootenay. | Nicola-Princeton. | Vancouver Island. | Northern. | |
| M.C. Pick-quick | .... | .... | 6 | .... | 6 |
| Siskol | .... | 5 | 10 | .... | 15 |
| Sullivan | .... | .... | 4 | .... | 4 |
| Rand | .... | 4 | 1 | .... | 5 |
| Totals | .... | 9 | 21 | .... | 30 |

The machine-mined coal produced by the different companies during 1927 and comparative figures for 1926 are as follows:—

| | 1927. Tons. | 1926. Tons. |
|---|---|---|
| Western Fuel Corporation of Canada, Nanaimo | 98,644 | 86,241 |
| Canadian Collieries (D.), Ltd., Comox | ..... | 3,751 |
| Nanoose Wellington Collieries | ..... | 10,587 |
| East Wellington Coal Co., Ltd. | 37,719 | 38,257 |
| Crow's Nest Pass Coal Co. | ..... | 1,644 |
| Corbin Coals, Ltd. | ..... | 700 |
| Tulameen Coal Co. | 17,140 | ..... |
| Lynden Coal Co. | 3,343 | ..... |
| Middlesboro Collieries, Ltd. | 12,000 | ..... |
| Totals | 168,846 | 141,180 |

## SAFETY-LAMPS.

There were 4,456 safety-lamps in use in the coal-mines of the Province. Of this number, 317 were flame-lamps of the Wolf type and 4,139 were electric lamps of various makes, as follows: Edison, 3,576; Wheat, 563. No open lights are allowed in the coal-mines of British Columbia.

The following table shows the distribution of lamps by district, method of locking, and the illuminant used:—

VANCOUVER ISLAND DISTRICT.

| Colliery and Mine. | Method of Locking Lamp. | | Illuminant used. | |
|---|---|---|---|---|
| | Magnetic Lock. | Screw or Automatic Clip. | Naphtha Gasoline. | Electricity. |
| No. 1 mine, Nanaimo | 51 | 593 | 51 | 593 |
| Reserve mine, Nanaimo | 13 | 233 | 13 | 233 |
| Wakesiah mine, Nanaimo | 11 | 142 | 11 | 142 |
| Wellington Extension Colliery | 38 | 670 | 38 | 670 |
| Comox Colliery | 20 | 500 | 20 | 500 |
| King & Foster Coal Co. | 3 | 60 | 3 | 60 |
| East Wellington Coal Co. | 10 | 120 | 10 | 120 |
| Granby Consolidated M.S. & P. Co. | 10 | 170 | 10 | 170 |
| Diamond Jubilee mine | 5 | ..... | 5 | ..... |
| Fiddick mine | 3 | ..... | 3 | ..... |
| Totals for district | 164 | 2,488 | 164 | 2,488 |

NICOLA-PRINCETON DISTRICT.

| | | | | |
|---|---|---|---|---|
| Middlesboro Colliery | 7 | 80 | 7 | 80 |
| Coalmont Colliery | 10 | 264 | 10 | 264 |
| Tulameen Valley Coal Co. | 2 | 32 | 2 | 32 |
| Southern Okanagan Coal Co. | 2 | ..... | 2 | ..... |
| Lynden Coal Mines, Ltd. | 3 | 30 | 3 | 30 |
| Totals for district | 24 | 406 | 24 | 406 |

NORTHERN DISTRICT.

| | | | | |
|---|---|---|---|---|
| Telkwa Collieries, Ltd. | 9 | ..... | 9 | ..... |

EAST KOOTENAY DISTRICT.

| | | | | |
|---|---|---|---|---|
| Coal Creek Colliery | 70 | 650 | 70 | 650 |
| Michel Colliery | 32 | 483 | 32 | 483 |
| Corbin Colliery | 18 | 112 | 18 | 112 |
| Totals for district | 120 | 1,245 | 120 | 1,245 |
| Totals for Province | 317 | 4,139 | 317 | 4,139 |

The following is a list of safety-lamps permitted for use in the coal-mines of British Columbia:—

APPROVED (ELECTRIC) SAFETY-LAMPS.

*No. 1.*—The electric lamp manufactured by the Edison Storage Battery Co., Orange, N.J., U.S.A., under approval No. 10 of the United States Bureau of Mines. This lamp shall be used with a flexible cord identified by the Bureau's specification CD–17. The only bulbs approved for use with this lamp are the symbol BM–10 bulbs, manufactured by the National Lamp Works of the General Electric Co., Cleveland, Ohio; the symbol BM–10 bulbs, manufactured by the Edison

Works of the General Electric Co., Harrison, N.J.; the symbol 26–V bulbs, manufactured by the Miniature Incandescent Lamp Corporation, 95 Eighth Avenue, Newark, N.J.; and the symbol BM–10 bulbs, manufactured by the Westinghouse Lamp Co., Bloomfield, N.J.

*No. 2.*—The Concordia approved portable electric (hand-lamp) mine-lamp, manufactured by the Concordia Electric Co., Pittsburgh, Pa., under approval No. 12 of the United States Bureau of Mines. The only bulbs approved for use with this lamp are the symbol Osram 08510 bulbs, sold by the Concordia Electric Company.

*No. 3.*—The Wico approved portable electric mine-lamp, manufactured by the Witherbee Igniter Co., Springfield, Mass., under approval No. 14 of the United States Bureau of Mines. This lamp shall be used with a flexible cord identified by the Bureau's specification CD–43. The only bulbs approved for use with the lamp are the symbol BM–14 bulbs, manufactured by the Edison Lamp Works of the General Electric Co., Harrison, N.J.

*No. 4.*—The Concordia approved permissible portable electric mine-lamp, manufactured by the Concordia Electric Co., Pittsburgh, Pa., under approval No. 12 of the United States Bureau of Mines. This lamp shall be used with a flexible cord identified by the Bureau's specification CD–17. The only bulbs approved for use with this lamp are the BM–15 bulbs, manufactured by the National Lamp Works of the General Electric Co., Cleveland, Ohio.

*No. 5.*—The Pioneer approved portable electric mine-lamp, manufactured by the Pioneer Electric Mine Lamp Co., Philadelphia, Pa., under approval No. 16 of the United States Bureau of Mines. This lamp shall be used with a flexible cord identified by the Bureau's specification No. CD–31, and with battery-plates manufactured by the Electric Storage Battery Co., Philadelphia, Pa. The only bulbs approved for use with this lamp are the BM–16 bulbs, manufactured by the Edison Lamp Works of the General Electric Co., Harrison, N.J.

*No. 6.*—The Wheat approved portable electric mine-lamp, manufactured by the Koehler Manufacturing Co. (Inc.), Marlboro, Mass., under approval No. 17 of the United States Bureau of Mines. This lamp shall be used with a flexible cord identified by the Bureau's specification CD–31, and with battery-plates manufactured by the General Lead Battery Co., Newark, N.J. The only bulbs approved for use with this lamp are the BM–17 bulbs, manufactured by the National Lamp Works of the General Electric Co., Cleveland, Ohio.

(Unless otherwise specified, all lamps are cap-lamps.)

### Approved (Flame) Safety-lamps.

*No. 12.*—The bonneted, double-gauze lamp, with magnetic lock, known as the Wolf lamp.

*No. 13.*—The flat-wick steel-frame lamp, as specified in approval No. 201 of the United States Bureau of Mines, manufactured by the Koehler Manufacturing Co., Marlboro, Mass., U.S.A.

*No. 14.*—The round-wick steel-frame lamp, as specified in approval No. 201–A of the United States Bureau of Mines, manufactured by the Koehler Manufacturing Co., Marlboro, Mass., U.S.A.

*No. 15.*—The flat-wick steel-frame lamp, as specified in approval No. 202 of the United States Bureau of Mines, manufactured by Ackroyd & Best, Ltd., Arrott Power Building, Pittsburgh, Pa., U.S.A.

*No. 16.*—The flat-wick aluminium-frame lamp, as specified in approval No. 203 of the United States Bureau of Mines, manufactured by the Koehler Manufacturing Co., Marlboro, Mass., U.S.A.

*No. 17.*—The round-wick aluminium-frame lamp, as specified in approval No. 203–A of the United States Bureau of Mines, manufactured by the Koehler Manufacturing Co., Marlboro, Mass., U.S.A.

Approvals Nos. 201, 201–A, 203, and 203–A apply to magnetic-lock lamps that are equipped with steel gauzes. The only glasses approved for use with these lamps are marked "Macbeth No. 2100 High Speed." The only igniter approved for use with these lamps is the Koehler pyro internal igniter, 1915 model, using a cerium-zinc-copper alloy for igniter-points.

Approval No. 202 applies to a magnetic-lock lamp. The only glasses approved for use with this lamp are marked as follows:—

ACKD
BEST
A–1

This lamp is relighted electrically. The only relighter approved for this lamp is the Ackroyd & Best underground relighter.

NOTE.—*While the use of flame safety-lamps is permitted, it is the policy of the Department of Mines to encourage the use of approved electric safety-lamps for all persons underground in the coal-mines, except such flame-lamps as may be required by the officials of the mines in the carrying-out of their duty.*

## ELECTRICITY.

Electric power is used for various purposes on the surface at twelve mines and underground at five. The purpose for which it was used, together with the amount of horse-power in each instance, is shown in the following table:—

| Above ground— Nature of its Use. | Aggregate H.P. |
|---|---|
| Winding or hoisting | 693 |
| Ventilation | 1,977 |
| Haulage | 600 |
| Coal washing or screening | 1,634 |
| Miscellaneous | 1,414 |
| Total horse-power | 6,318 |
| Underground— | |
| Haulage | 1,940 |
| Pumping | 590 |
| Coal-cutting | 30 |
| Miscellaneous | 35 |
| Total horse-power | 2,595 |
| Total horse-power above and under ground | 8,913 |

Of the above amount, approximately 1,800 horse-power was operated as direct current and 7,113 horse-power as alternating current.

The electrical regulations passed in 1925 prohibits the use of electric locomotives by the open trolley-wire system after the 1st day of January, 1930; power being given to the Minister of Mines to grant exemption in special circumstances.

## VENTILATION.

The District Inspectors' reports give details regarding the ventilation in the splits and main returns of the various mines. In one or two instances demands had to be made during the year for increases in the amount of air being circulated in a few of the splits in a few mines, but on the whole the provisions requiring adequate ventilation were generally well observed at the different mines.

## USE OF THE BURRELL GAS INDICATOR.

The Burrell Gas Indicator is used in practically every ventilating-split at least once a month and continues to be the approved method of determining the $CH_4$ content in the mine atmosphere where the percentage is too small to be detected by means of the flame safety-lamp.

## MINE-AIR SAMPLES.

Mine-air sampling was carried out as usual during the year and 216 samples were collected in the coal-mines of the Province; of this number, twelve were spoiled in transit and accidents in the laboratory. While samples were taken in all mines at intervals, this method is carried out most intensively in the mines of the Crowsnest Pass District, where the gas-outflow is much higher than in the other mining districts of the Province.

The following table shows the analyses of mine-air samples taken in the various splits and main returns of the coal-mines in the Province during 1927 (the detailed analyses of mine-air samples taken in other portions of the various mines are on file in the office of the Chief Inspector of Mines):—

## Returns from Mine-air Samples taken in the Various Splits and Main Return Airways of the Coal-mines of the Province during the Year 1927.

| Sample No. | Date. | Mine. | Ventilating District. | Working or Idle. | Tonnage per Day. | Tonnage of Split per Day. | Chemical Analyses. | | | | Velocity of Air in Feet per Minute. | Quantity of Air in Cubic Feet per Minute. | Barometer. | Hygrometer. | | | Cubic Feet of Methane per Minute. | Cubic Feet of Methane per Day. | Cubic Feet of Methane per Ton. | Tons Methane per Day. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | $CO_2$. | O. | $CH_4$. | N. | | | | Wet Bulb. | Dry Bulb. | Humidity. | | | | |
| | | *Vancouver Island.* | | | | | | | | | | | | | | | | | | |
| 5J | April 5 | Wakesiah | Lewis's heading | Working | 275 | 200 | 0.45 | 19.65 | 0.22 | 79.68 | 480 | 12,000 | 29.90 | 58.0 | 61.0 | 92.0 | 26 | 37,440 | 187 | 0.80 |
| 7J | " 28 | No. 2, Extension | No. 2 split | " | 375 | 150 | 0.61 | 20.15 | 0.04 | 79.20 | .... | 27,300 | 29.70 | 48.0 | 50.0 | 94.0 | 10 | 14,400 | 96 | 0.31 |
| 8J | " 19 | " | No. 1 split | " | 375 | 200 | 0.69 | 19.84 | 0.05 | 79.42 | ... | 25,200 | 29.70 | 58.0 | 58.0 | 100.0 | 13 | 18,720 | 94 | 0.40 |
| 9J | " 28 | No. 1 mine (W.F.C.) | Newcastle return | " | 500 | .... | 0.33 | 20.21 | 0.09 | 79.37 | .... | 27,000 | 29.90 | ... | .... | ..... | 24 | 34,560 | 69 | 0.74 |
| 10J | May 6 | No. 1, Extension | No. 1 slope return | " | .... | 200 | 1.27 | 18.83 | 0.53 | 79.37 | .... | 20,000 | 29.44 | 53.0 | 54.0 | 94.0 | 106 | 152,640 | 763 | 3.27 |
| 11J | " 16 | No. 5, S. Wellington | Main return | " | 250 | .... | 0.17 | 20.70 | 0.37 | 78.76 | .... | 20,000 | 29.90 | 57.0 | 63.0 | 69.0 | 74 | 106,560 | 426 | 2.28 |
| 12J | " 19 | No. 1, E. Wellington | " | " | 200 | .... | 0.13 | 20.77 | 0.29 | 78.81 | .... | 24,000 | 29.80 | 58.0 | 59.0 | 94.0 | 70 | 100,800 | 504 | 2.16 |
| 17J | June 13 | No. 1, Extension | " | " | 300 | .... | 0.40 | 20.42 | 0.04 | 79.14 | 533 | 32,000 | 30.05 | 50.0 | 51.0 | 94.0 | 13 | 18,720 | 62 | 0.40 |
| 18J | Nov. 10 | Wakesiah | " | " | 250 | .... | 0.12 | 20.77 | 0.05 | 79.06 | 300 | 12,000 | 29.50 | 58.0 | 59.0 | 94.0 | 6 | 8,640 | 35 | 0.18 |
| 19J | " 11 | No. 1, E. Wellington | " | " | 165 | .... | 0.06 | 20.89 | 0.16 | 78.89 | 250 | 20,000 | 29.50 | 58.0 | 59.0 | 94.0 | 32 | 46,080 | 280 | 0.98 |
| 21J | " 20 | No. 5, S. Wellington | " | " | 290 | .... | 0.17 | 20.52 | 0.31 | 79.00 | 400 | 28,000 | 29.80 | 56.0 | 57.0 | 94.0 | 87 | 125,280 | 432 | 2.68 |
| 23J | " 21 | No. 1 mine (W.F.C.) | Newcastle return | " | 464 | .... | 0.15 | 20.59 | 0.09 | 79.17 | .... | 36,000 | 30.20 | 55.0 | 56.0 | 94.0 | 32 | 46,080 | 99 | 0.98 |
| 24J | " 28 | No. 2, Extension | No. 2 split | " | 350 | 150 | 0.26 | 20.65 | 0.02 | 79.07 | 600 | 24,000 | 29.08 | 53.0 | 54.0 | 94.0 | 5 | 7,200 | 48 | 0.15 |
| 25J | Dec. 22 | No. 1, Extension | Main return | " | 350 | .... | 0.50 | 20.13 | 0.07 | 79.30 | .... | 28,000 | 29.80 | 55.0 | 56.0 | 94.0 | 20 | 28,800 | 82 | 0.62 |
| 350 | Jan. 3 | No. 5, Comox (C.C.) | West Side return | " | 80 | 40 | 0.06 | 20.88 | 0.09 | 78.97 | 650 | 45,000 | 29.80 | 50.0 | 50.0 | 100.0 | 41 | 59,040 | 1,476 | 1.26 |
| 351 | " 3 | " " | Main return | " | 80 | .... | 0.06 | 20.89 | 0.11 | 78.94 | 920 | 92,000 | 29.80 | 50.0 | 50.0 | 100.0 | 101 | 145,400 | 1,818 | 3.11 |
| 365 | April 18 | No. 1 mine, Cassidy | South Side split | " | 700 | 120 | 0.19 | 20.62 | 0.14 | 79.05 | 600 | 35,000 | 29.70 | 59.0 | 60.0 | 94.0 | 49 | 70,560 | 588 | 1.51 |
| 366 | " 19 | " " | North Side split | " | 700 | 250 | 0.11 | 20.64 | 0.47 | 78.78 | 200 | 12,000 | 29.70 | 59.0 | 60.0 | 94.0 | 56 | 80,640 | 323 | 1.72 |
| 367 | May 30 | Reserve mine | Main return | " | 650 | ... | 0.16 | 20.66 | 0.06 | 79.12 | 500 | 30,000 | 30.00 | 58.0 | 59.0 | 94.0 | 18 | 25,920 | 40 | 0.55 |
| 370 | June 10 | No. 4, Comox (C.C.) | No. 2 Slope return | " | 400 | .... | 0.20 | 20.55 | 0.42 | 78.83 | 1,200 | 93,000 | 29.50 | 53.0 | 53.0 | 100.0 | 391 | 553,040 | 141 | 12.05 |
| 383 | Oct. 20 | " " | No. 1 Slope return | " | 425 | ... | 0.41 | 19.87 | 0.04 | 79.68 | 80 | 5,000 | 29.50 | 52.0 | 52.0 | 100.0 | 2 | 2,880 | 6 | 0.06 |
| | | *Coal Creek.* | | | | | | | | | | | | | | | | | | |
| 1486 | Jan. 5 | No. 1 East mine | No. 3 split | " | 780 | 200 | 0.07 | 20.64 | 0.86 | 78.43 | 300 | 25,500 | 25.50 | 51.0 | 53.0 | 88.0 | 219 | 315,360 | 1,577 | 5.83 |
| 1488 | " 5 | " | No. 4 split | " | 780 | 120 | 0.11 | 20.61 | 0.74 | 78.54 | 200 | 17,600 | 25.50 | 52.0 | 53.0 | 93.0 | 130 | 187,200 | 1,560 | 3.46 |
| 1489 | " 5 | " | North return | " | 780 | ... | 0.09 | 20.93 | .... | 78.98 | 1,280 | 115,200 | 25.50 | 55.0 | 55.0 | 100.0 | .... | ..... | ..... | .... |
| 1490 | " 10 | No. 3 mine | No. 1 split | " | 400 | 100 | 0.11 | 20.78 | 0.31 | 78.80 | 100 | 6,000 | 25.80 | 60.0 | 61.0 | 93.0 | 19 | 27,360 | 274 | 0.51 |
| 1491 | " 10 | " | No. 2 split | " | 400 | 300 | 0.80 | 20.17 | 1.84 | 77.69 | 490 | 35,280 | 25.80 | 70.0 | 70.0 | 100.0 | 649 | 934,560 | 3,115 | 17.29 |
| 1492 | " 10 | " | Main return | " | 400 | .... | 0.20 | 20.42 | 0.92 | 78.46 | 1,100 | 66,000 | 25.80 | 65.5 | 66.0 | 98.0 | 607 | 874,080 | 2,185 | 16.17 |
| 1493 | " 11 | No. 1 East mine | No. 2 split | " | 750 | 180 | 0.27 | 20.13 | 1.97 | 77.63 | 270 | 16,200 | 25.50 | 56.0 | 57.0 | 93.0 | 319 | 459,360 | 2,552 | 8.50 |
| 1495 | " 28 | No. 1 South mine | " | " | 200 | 200 | 0.15 | 20.72 | 0.41 | 78.72 | 360 | 18,000 | 25.00 | 45.0 | 45.0 | 100.0 | 74 | 106,560 | 533 | 1.97 |
| 1496 | " 28 | " | No. 1 split | Idle | 200 | ... | 0.24 | 20.35 | 0.88 | 78.53 | 200 | 17,000 | 25.00 | 51.0 | 52.0 | 93.0 | 150 | 216,000 | .... | .... |
| 1498 | Feb. 1 | No. 2 mine | No. 4 incline | Working | 400 | 200 | 0.55 | 19.92 | 1.29 | 78.24 | 330 | 21,450 | 25.20 | 69.0 | 69.0 | 100.0 | 277 | 398,880 | 1,994 | 7.37 |
| 1499 | " 1 | " | Main return | " | 400 | .... | 0.57 | 19.93 | 0.90 | 78.61 | 530 | 37,100 | 25.20 | 70.0 | 70.5 | 98.0 | 334 | 480,960 | 1,202 | 8.90 |
| 1502 | March 8 | No. 3 mine | No. 1 split | " | 400 | 100 | 0.17 | 20.58 | 0.98 | 78.27 | 350 | 17,500 | 25.20 | .... | .... | ..... | 172 | 247,680 | 2,477 | 4.98 |
| 1503 | " 8 | " | No. 2 split | " | 400 | 300 | 0.29 | 20.13 | 2.17 | 77.41 | 500 | 36,000 | 25.20 | .... | ... | ..... | 781 | 1,124,640 | 3,749 | 20.80 |
| 1504 | " 8 | " | Main return | " | 400 | .... | 0.29 | 20.24 | 1.56 | 77.91 | 1,140 | 68,400 | 25.20 | .... | .... | ..... | 1,067 | 1,536,480 | 3,841 | 28.42 |
| 1505 | " 17 | No. 1 East mine | No. 1 split | " | 750 | 285 | 0.16 | 20.32 | 1.92 | 77.60 | 570 | 31,920 | 25.30 | 58.0 | 58.5 | 98.0 | 613 | 882,720 | 3,097 | 16.33 |
| 1506 | " 17 | " | No. 2 split | " | 750 | 180 | 0.25 | 20.04 | 2.50 | 77.21 | 450 | 27,000 | 25.30 | 55.5 | 56.0 | 98.0 | 675 | 972,000 | 5,400 | 17.98 |
| 1507 | " 28 | No. 1 South mine | No. 1 split | " | 200 | ... | 0.39 | 20.05 | 0.96 | 78.60 | 230 | 12,880 | 25.60 | 61.0 | 61.5 | 97.0 | 124 | 176,560 | 883 | 3.26 |
| 1509 | " 28 | " | Main return | " | 200 | .... | 0.29 | 20.26 | 0.64 | 79.01 | 780 | 46,800 | 25.60 | 60.0 | 60.0 | 100.0 | 300 | 432,000 | 2,160 | 7.99 |
| 1511 | " 30 | No. 1 East mine | No. 3 split | " | 750 | 150 | 0.15 | 20.40 | 1.94 | 77.51 | 300 | 25,500 | 25.90 | 52.0 | 53.0 | 93.0 | 495 | 712,800 | 4,752 | 12.08 |
| 1513 | " 30 | " | North return | " | 750 | 465 | 0.17 | 20.41 | 1.46 | 77.96 | 1,220 | 109,800 | 25.90 | 52.0 | 53.0 | 93.0 | 1,603 | 2,308,320 | 4,964 | 42.70 |

## Returns from Mine-air Samples taken in the Various Splits and Main Return Airways of the Coal-mines of the Province during the Year 1927—*Continued.*

| Sample No. | Date. | Mine. | Ventilating District. | Working or Idle. | Tonnage per Day. | Tonnage of Split per Day. | Chemical Analyses. | | | | Velocity of Air in Feet per Minute. | Quantity of Air in Cubic Feet per Minute. | Barometer. | Hygrometer. | | | Cubic Feet of Methane per Minute. | Cubic Feet of Methane per Day. | Cubic Feet of Methane per Ton. | Tons Methane per Day. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | $CO_2$. | O. | $CH_4$. | N. | | | | Wet Bulb. | Dry Bulb. | Humidity. | | | | |
| | | *Coal Creek*—Contd. | | | | | | | | | | | | | | | | | | |
| 1514 | April 12 | No. 2 mine | No. 4 Incline | Working | 400 | 200 | 0.45 | 19.95 | 1.14 | 78.46 | 340 | 22,100 | 26.10 | 69.5 | 69.5 | 100.0 | 252 | 362,880 | 1,814 | 6.71 |
| 1515 | " 12 | " | Main return | " | 400 | .... | 0.51 | 20.06 | 0.77 | 78.66 | 650 | 45,500 | 26.10 | 70.0 | 70.0 | 100.0 | 350 | 504,000 | 1,260 | 9.32 |
| 1516 | May 15 | No. 3 mine | No. 1 split | " | 400 | 100 | 0.26 | 20.49 | 0.93 | 78.32 | 320 | 12,800 | 26.00 | 59.0 | 60.0 | 93.0 | 119 | 171,360 | 1,713 | 3.17 |
| 1517 | " 5 | " | No. 2 split | " | 400 | 300 | 0.28 | 20.22 | 1.84 | 77.66 | 600 | 43,200 | 26.00 | 70.0 | 70.0 | 100.0 | 795 | 1,144,800 | 3,816 | 21.17 |
| 1518 | " 5 | " | Main return | " | 400 | .... | 0.28 | 20.28 | 1.29 | 78.15 | 470 | 70,200 | 26.00 | 66.0 | 66.0 | 100.0 | 906 | 1,304,640 | 3,262 | 24.13 |
| 1519 | " 10 | No. 1 East mine | No. 1 split | " | 750 | 285 | 0.14 | 20.28 | 1.76 | 77.82 | 840 | 33,600 | 26.00 | 60.0 | 60.0 | 100.0 | 591 | 851,040 | 2,986 | 15.74 |
| 1520 | " 10 | " | No. 2 split | " | 750 | 180 | 0.16 | 20.21 | 2.34 | 77.29 | 450 | 27,000 | 26.00 | 55.0 | 56.0 | 93.0 | 632 | 910,080 | 5,056 | 16.83 |
| 1525 | " 16 | No. 1 South mine | No. 1 split | " | 260 | .... | 0.47 | 19.84 | 1.04 | 78.65 | 200 | 11,200 | 26.00 | 60.0 | 60.0 | 100.0 | 116 | 167,040 | 642 | 3.09 |
| 1526 | " 16 | " | No. 2 split | " | 260 | 260 | 0.10 | 20.82 | 0.20 | 78.88 | 300 | 15,000 | 26.00 | 45.0 | 45.0 | 100.0 | 30 | 43,200 | 166 | 0.79 |
| 1529 | " 17 | No. 2 mine | Main return | " | 350 | .... | 0.26 | 20.43 | 0.67 | 78.64 | 820 | 57,400 | 25.60 | 70.0 | 70.0 | 100.0 | 384 | 552,960 | 1,580 | 10.22 |
| 1530 | July 6 | " | Diagonal district | " | 350 | 125 | 0.21 | 20.61 | 0.85 | 78.33 | 150 | 12,000 | 26.00 | 61.0 | 61.5 | 98.0 | 102 | 146,880 | 1,175 | 2.71 |
| 1531 | " 7 | No. 3 mine | No. 2 split | " | 350 | 250 | 0.32 | 20.13 | 2.08 | 77.47 | 480 | 34,500 | 26.20 | 69.0 | 69.5 | 98.0 | 718 | 1,033,920 | 4,135 | 19.12 |
| 1533 | " 19 | " | No. 1 split | " | 350 | 100 | 0.21 | 20.60 | 0.71 | 78.48 | 240 | 12,000 | 26.00 | 64.0 | 64.0 | 100.0 | 85 | 122,400 | 1,224 | 2.26 |
| 1534 | " 19 | No. 1 East mine | Main return | " | 350 | ... | 0.30 | 20.33 | 1.11 | 78.26 | 1,000 | 60,000 | 26.00 | 66.0 | 66.0 | 100.0 | 666 | 959,040 | 2,740 | 17.74 |
| 1535 | " 21 | " | No. 1 split | " | 900 | 425 | 0.25 | 20.32 | 1.30 | 78.13 | 700 | 35,000 | 26.25 | 60.0 | 60.5 | 98.0 | 455 | 655,200 | 1,541 | 12.12 |
| 1536 | " 21 | " | No. 2 split | " | 900 | 165 | 0.24 | 20.21 | 2.12 | 77.43 | 400 | 22,000 | 26.25 | 60.0 | 61.0 | 98.0 | 466 | 671,040 | 4,067 | 12.41 |
| 1538 | " 23 | " | No. 4 split | " | 900 | 180 | 0.20 | 20.46 | 1.44 | 77.90 | 150 | 13,200 | 26.20 | 56.0 | 57.0 | 96.0 | 190 | 273,600 | 1,520 | 5.06 |
| 1539 | " 23 | " | East Side return | " | 900 | 465 | 0.16 | 20.47 | 1.22 | 78.15 | 1,160 | 104,400 | 26.20 | 56.0 | 56.5 | 98.0 | 1,273 | 1,833,120 | 3,942 | 33.91 |
| 1541 | " 25 | No. 2 mine | Main return | " | 350 | .... | 0.50 | 20.10 | 0.64 | 78.76 | 660 | 46,200 | 25.95 | 71.0 | 71.0 | 100.0 | 296 | 426,240 | 1,218 | 7.88 |
| 1542 | " 28 | No. 1 South mine | No 2 split | " | 230 | 230 | 0.16 | 20.73 | 0.30 | 78.81 | 200 | 10,000 | 26.25 | 52.0 | 52.0 | 100.0 | 30 | 43,200 | 188 | 0.80 |
| 1543 | " 28 | " | No. 1 split | " | 230 | .... | 0.65 | 19.49 | 1.13 | 78.73 | 310 | 15,500 | 26.25 | 69.0 | 69.0 | 100.0 | 175 | 252,000 | 1,096 | 4.66 |
| 1545 | Aug. 9 | No. 1 East mine | No. 3 split | " | 900 | 120 | 0.21 | 20.25 | 1.98 | 77.56 | 285 | 22,800 | 26.10 | 58.0 | 59.0 | 94.0 | 451 | 649,440 | 5,412 | 12.01 |
| 1547 | Sept. 6 | No. 3 mine | No. 2 split | " | 350 | 250 | 0.30 | 20.22 | 1.54 | 77.94 | 530 | 38,100 | 25.65 | 69.0 | 71.0 | 94.0 | 587 | 845,280 | 3,381 | 15.64 |
| 1557 | " 21 | No. 1 East mine | " | " | 900 | 165 | 0.21 | 20.32 | 1.54 | 77.93 | 500 | 17,500 | 26.20 | 61.0 | 62.0 | 93.0 | 270 | 388,800 | 2,356 | 7.07 |
| 1572 | Nov. 15 | " | No. 1 split | " | 885 | 450 | 0.17 | 20.33 | 1.66 | 77.84 | 220 | 17,600 | 25.90 | 58.0 | 59.0 | 93.0 | 292 | 420,480 | 934 | 7.78 |
| 1573 | " 15 | " | No. 2 split | " | 885 | 100 | 0.20 | 20.29 | 1.56 | 77.95 | 500 | 25,000 | 25.90 | 60.0 | 61.0 | 93.0 | 390 | 561,600 | 5,616 | 10.39 |
| 1575 | " 16 | " | No. 4 split | " | 885 | 135 | 0.14 | 20.46 | 1.47 | 77.93 | 200 | 17,600 | 25.80 | 55.0 | 56.0 | 93.0 | 259 | 373,960 | 2,770 | 6.91 |
| 1578 | Dec. 12 | " | No. 3 split | " | 885 | 150 | 0.14 | 20.45 | 1.33 | 78.08 | 350 | 24,400 | 25.30 | .... | .... | .... | 324 | 466,560 | 3,110 | 8.63 |
| | | *Michel.* | | | | | | | | | | | | | | | | | | |
| 577 | March 9 | No. 3 mine | No. 2 split | " | 850 | 460 | 0.11 | 20.64 | 0.84 | 78.41 | 130 | 14,040 | 25.80 | 45.0 | 45.0 | 100.0 | 118 | 169,920 | 369 | 3.14 |
| 579 | " 9 | " | No. 4 split | " | 850 | 130 | 0.06 | 20.78 | 0.73 | 78.43 | 400 | 30,800 | 25.80 | 47.5 | 48.0 | 98.0 | 225 | 334,000 | 2,569 | 6.18 |
| 580 | " 9 | " | No. 5 split | " | 850 | 100 | 0.10 | 20.66 | 0.78 | 78.46 | 450 | 36,000 | 25.80 | 47.0 | 48.0 | 93.0 | 281 | 404,640 | 4,046 | 7.48 |
| 587 | July 7 | " | No. 3 split | " | 850 | 150 | 0.08 | 20.75 | 0.73 | 78.44 | 180 | 16,200 | 26.30 | 50.0 | 50.0 | 100.0 | 118 | 169,920 | 1,132 | 3.14 |
| 588 | " 8 | No. 8 mine | No. 1 split | " | 750 | 425 | 0.38 | 20.47 | 0.11 | 79.04 | 260 | 18,200 | 25.50 | 57.0 | 57.0 | 100.0 | 20 | 28,800 | 68 | 0.53 |
| 599 | Sept. 29 | No. 3 mine | Main return | " | 820 | ... | 0.21 | 20.51 | 0.63 | 78.65 | 1,250 | 125,000 | 25.80 | 53.0 | 54.0 | 93.0 | 788 | 1,134,720 | 1,384 | 20.99 |
| 563 | Nov. 23 | " | No. 4 District | " | 900 | 180 | 0.21 | 20.51 | 1.28 | 78.09 | 230 | 20,240 | ..... | 56.0 | 57.0 | 93.0 | 259 | 372,960 | 2,072 | 6.90 |
| 564 | " 23 | " | No. 3 split | " | 900 | 120 | 0.13 | 20.54 | 1.32 | 78.01 | 300 | 25,500 | ..... | 57.0 | 58.0 | 93.0 | 337 | 485,280 | 4,044 | 8.97 |
| | | *Corbin.* | | | | | | | | | | | | | | | | | | |
| 44 | Oct. 13 | No. 4 mine | Main Return | " | 300 | 300 | 0.16 | 20.76 | 0.17 | 78.91 | 440 | 8,800 | 24.50 | 49.0 | 50.0 | 93.0 | 15 | 21,600 | 72 | 0.40 |
| 45 | " 14 | No. 6 mine | No. 1 split | " | 320 | 110 | 0.10 | 20.88 | 0.13 | 78.89 | 200 | 16,000 | 24.70 | 45.0 | 45.0 | 100.0 | 21 | 30,240 | 275 | 0.56 |
| 46 | " 15 | " | No. 2 split | " | 320 | 210 | 0.09 | 20.67 | 0.03 | 79.01 | 400 | 6,400 | 24.70 | 44.0 | 44.0 | 100.0 | 2 | 2,880 | 14 | 0.05 |

## INSPECTION COMMITTEES.

Practically all the mines throughout the Province have had inspection committees, appointed by the workmen under General Rule 37, section 101, "Coal-mines Regulation Act," who made monthly inspections on behalf of the employees.

The courtesy is acknowledged of many of the inspection committees in forwarding copies of their reports to this office. The different operations were reported by the above inspection committees to be in good condition generally.

## COAL-DUST.

During 1925 regulations for precautions against coal-dust were put into force pursuant to the provisions of the "Coal-mines Regulation Act."

The floor, roof, and sides of every road or part of a road which is accessible must now be treated in one of the following ways: Either they shall be treated with incombustible dust in such manner and at such intervals as will ensure that the dust on the floor, roof, and sides respectively shall always consist throughout of a mixture containing not more than 50 per cent. combustible matter; or they shall be treated with water in such manner and at such intervals as will ensure that the dust on the floor, roof, and sides respectively is always combined throughout with 30 per cent., by weight, of water in the intimate mixture.

Tests of samples of dust, so taken as to be representative of the normal composition of the dust throughout the roads of the mine on the floor, roof, and sides respectively, shall be made as often as may be necessary, but not less frequently than once a month.

The results of the tests shall be posted at the entrance to the mine and recorded in a book to be kept at the mine for the purpose.

Since the passing of the regulations for precautions against coal-dust the operating companies have been giving this matter great attention, and through courtesy from them the Chief Inspector of Mines' office is furnished with copies of all tests made. Practically all the coal-mines in the Province have now got their roadways up to the standard required by the regulations.

## EXPLOSIONS.

An explosion occurred in No. 6 mine, Corbin Colliery, on October 1st, resulting in the deaths of two men. The following is the report of my investigation into this accident:—

"*Honourable William Sloan,*
*Minister of Mines, Victoria, B.C.*

"Sir,—I have the honour to submit herewith my report of investigation into the explosion which occurred in No. 6 mine, Corbin Coals, Limited, on October 1st, 1927.

"On October 1st I received telegrams from E. L. Warburton, manager, Corbin Coals, Limited, and Senior Inspector of Mines, Robt. Strachan, Fernie, informing me that an explosion had occurred in No. 6 mine, Corbin Colliery, with fatal results to one man and serious injury to another. I left at once for Corbin, arriving there 11 a.m. on October 3rd.

"The information available showed that only two men had been in the mine at the time of the explosion, which happened during the night shift (midnight September 30th to 8 a.m. October 1st).

"The first indication of anything unusual was when William Cummings, day-shift fireboss, arrived at the mine a few minutes before 8 o'clock on October 1st and found no signs of the night-shift fireboss, it being customary for the off-coming fireboss to be out of the mine and have his report of conditions made before the day shift arrived.

"After waiting a short time Cummings went into the mine to see if anything was wrong, and on reaching a point about 300 feet from the portal he found smoke and signs of an explosion and immediately returned to the outside and raised the alarm.

"Accompanied by one of his men, he re-entered the mine in order to render help to the missing men and was shortly afterwards joined by the mine overman, Wm. Almond, and a crew of men, who proceeded with the restoration of the ventilation sufficiently to permit them reaching No. 9 crosscut, which is the termination of Nos. 3 and 5 levels.

"On this crosscut they found the body of William Wanhella, miner, and near by also found Thomas Ratcliffe, fireboss, in an unconscious condition.

"Ratcliffe was removed to the hospital and the ventilation further restored, so that all the explosion area could be explored.

"Nothing further was done up to the time of my arrival.

"*Description of No. 6 Mine (Explosion Area) Workings.*—This operation is about 5,400 feet above sea-level and works a highly inclined deposit of coal that is approximately 600 feet deep and of varying width up to 400 feet.

"The method of working is by developing a system of raises and levels until a number of small pillars are blocked out; the pillars are then extracted on the retreating system and the coal above caves, due to natural weight and pressure, and is recovered and loaded from the chutes on the Main level.

"The area where the explosion occurred is reached by two levels—No. 3 South, which serves as the air-intake, and No. 5 South, which is the main haulage-way and return airway.

"The above-mentioned raises and levels, for caving purposes, were started from No. 9 crosscut, which is the innermost connection between Nos. 3 and 5 South levels, and had been driven 28 feet on a pitch of 55°. At this point the raises were connected by crosscuts and the small pillars formed at this elevation; Nos. 1, 2, and 3 West crosscuts and No. 1 chute terminating in the caving started from the end of No. 5 South level.

"*Conditions found after the Explosion.*—When I examined this area, in company with Senior Inspector of Mines Strachan, Inspector MacDonald, and Manager E. L. Warburton, on October 3rd and 4th, the roof formed by the caving was from 20 to 25 feet above the roof-line of the small pillar section, and explosive gas was found at this roof-line.

"The area of the cavity at this elevation was about 60 by 40 feet and the sides sloped inwards until they met at the approximate height of 25 feet, as mentioned above.

"Beyond restoring the ventilation nothing had been disturbed until I reached Corbin, and all that had been found belonging to the two men were their electric-lamp batteries and one head-light; Ratcliffe's electric-lamp battery having been found on his belt and Wanhella's battery near the top of No. 3 chute with the head-piece.

"A shot-firing cable, broken in several places, was found stretched out from a point on No. 2 West crosscut up No. 2 chute and along No. 3 West crosscut to the caving operations. All the indications point to a shot having been fired immediately prior to the explosion.

"On the roadways at the top of the chutes a few tons of fine coal and debris was scattered around and I had this carefully turned over and searched for the fireboss's flame safety-lamp, but while the search uncovered the shot-firing battery and the key for same, no trace of the flame safety-lamp could be found.

"On going outside to the lamp-house, inquiries established the fact that no flame safety-lamp was unaccounted for.

"Only ten flame safety-lamps had been in use for several weeks prior to the explosion, and this was attested by the weekly report signed by the man in charge of the lamp-house. These ten lamps were accounted for at the time of my visit and were in use.

"So far investigation and inquiry points to the fact that Thomas Ratcliffe, the fireboss in charge at the time of the explosion, did not have a flame safety-lamp or any other means whereby he could determine the presence of inflammable or explosive gas, and that he had fired a shot or shots in the presence of gas.

"Investigation and evidence given at the inquest held at Corbin on October 4th showed that the fireboss in charge of No. 6 mine on the afternoon shift on September 30th did not leave the fireboss station at the mine until after midnight and had not met Ratcliffe, the night-shift fireboss.

"This is contrary to ordinary practice, and Cheetham, the afternoon fireboss, said it was the first occasion, since working in Corbin, that the relieving fireboss had not met him at the change of shifts.

"*Conclusions.*—There must have been sufficient explosive gas in the vicinity of the shot to have been easily detected had the flame safety-lamp been used for this purpose.

"This evidently had not been done, and the shot had either blown out or had blown through on the side or back of the hole owing to having too little work to do.

"All the evidence available leads to the belief that Ratcliffe did not have a flame safety-lamp with which to test the air for the presence of inflammable or explosive gas; in any case he had not observed the requirements of the 'Coal-mines Regulation Act,' section 101, Rule 12:—

"'(*a.*) (i.) A competent person who shall be appointed for the purpose shall, immediately before the charging of any shothole, examine such hole, shall see the coal is well prepared, the shot properly placed, and that the borehole is well cleaned; he shall examine the character of explosive and shall regulate the quantity of such explosive to be used in such hole, and such hole shall be loaded in accordance with his instructions. He shall examine all places contiguous thereto within a radius of twenty-five yards, and shall not allow the shot to be fired unless he finds it safe to do so, and a shot shall not be fired except by or under the immediate direction of such competent person appointed for the purpose. . . .'

"Accompanying this is a plan showing the location and details of this explosion area.

"Respectfully submitted.

"JAMES DICKSON,
*Chief Inspector of Mines.*"

## SULPHUR-POISONING.

While some evidence, principally by smell, shows that sulphur exists in some of the areas being worked, no complaints have reached this office during 1927 to the effect that any miners were seriously affected by this condition.

## DANGEROUS OCCURRENCES.

During 1927 there were reported, as provided for by section 71, subsections (*c*) to (*h*), twenty-one occurrences, as follows: Eleven blow-outs of gas and coal; two bumps; six underground fires; breaking of a brake-strap on a hoisting-engine; and one explosion. Of the above blow-outs, ten occurred in Coal Creek Colliery and one in Cassidy.

## ORDER STOPPING WORK UNDER AUTHORITY OF SECTION 87.

In a few instances during 1927 stoppage of work was ordered by the Inspection Department in parts of mines until proper remedies were applied for safeguarding those employed.

Usually a willing spirit of co-operation was shown by the various managements at collieries in applying the required remedies.

## INQUIRIES.

Following the conviction of Ysuto Oda, miner, No. 4 mine, Comox Colliery, for failing to sufficiently timber his working-place, the Honourable Minister of Mines appointed Mr. William Wall to hold an inquiry into the conduct of the said Ysuto Oda in accordance with the provisions of the "Coal-mines Regulation Act" (sections 48 and 49). The grounds for the inquiry were that:—

(*a.*) Ysuto Oda was convicted on March 18th, 1927, of a violation of Special Rule No. 76, established under section 102, "Coal-mines Regulation Act."

(*b.*) That Ysuto Oda was not sufficiently familiar with the English language to render safe his employment as a coal-miner.

After hearing the evidence Commissioner Wall suspended indefinitely certificate of competency as a coal-miner No. O-329 (granted March 3rd, 1913) held by Ysuto Oda.

## PROSECUTIONS.

During 1927 there were nine prosecutions made, all of which resulted in convictions. Details of the cases are given in a table at the end of this section.

## MINE-RESCUE AND TRAINING.

During the year many holders of certificates of competency in mine-rescue work underwent training at the different stations, and the following men completed the training course and obtained certificates:—

| Cert. No. | Name. | Where trained. | Cert. No. | Name. | Where trained. |
|---|---|---|---|---|---|
| 608 | Horace Bate | Nanaimo. | 614 | Peter Kemp | Nanaimo. |
| 609 | Edward James | Nanaimo. | 615 | Edward Haddon | Nanaimo. |
| 610 | Robt. Emery | Nanaimo. | 616 | Fred Menzies | Nanaimo. |
| 611 | Wm. W. Frew | Nanaimo. | 617 | Thos. H. Chapman | Nanaimo. |
| 612 | George Black | Nanaimo. | 618 | Harry A. Meikle | Nanaimo. |
| 613 | Joseph R. Wilson | Nanaimo. | 619 | Richard Rallison | Nanaimo. |

During 1927 thirty Burrell all-service gas-masks were added to the equipment of the mine-rescue stations, making a total of forty-two sets of this type of apparatus.

The Burrell all-service gas-mask proved to be of valuable service to miners engaged in dealing with underground fires in Comox Colliery, Middlesboro Colliery, and Coalmont Colliery during 1927.

Where there is sufficient oxygen in the atmosphere to support life, the light weight of this apparatus and the comparative freedom it permits the wearer makes underground fire-fighting less hazardous.

During the year several moving pictures devoted to safety practice in coal-mining were shown in Cumberland, Ladysmith, and Nanaimo.

The above films were produced by the United States Bureau of Mines and obtained by the Provincial Department of Mines through the kind offices of the Department of Mines, Ottawa. The films were shown at the theatres in the different towns and were favourably commented on by those interested in mining.

## MINE-RESCUE AND FIRST-AID COMPETITIONS.

The East Kootenay Mine Safety Association held its sixth annual mine-rescue and first-aid meet at the Government Rescue Station, Fernie, on August 27th.

In the mine-rescue contest there were five teams—two from Fernie, two from Michel, and one from Coal Creek. The work of all the teams was excellent and the different ratings of the teams were based largely on details. However, this, particularly, is a phase of mine-work where the safety of those taking part may depend on such details.

First place was gained by the Coal Creek team, consisting of John Caufield (captain), W. Cockburn, J. Hailes, J. Parker, and J. Graham; this team obtained 99.4 per cent. of the marks available. Fernie No. 1 team—M. Hilton (captain), J. Yates, A. R. Williams, A. Hilton, and J. Jaines—took second place with 98.2 per cent.; and Fernie No. 2 team, composed of Wm. Hynds (captain), N. Cockburn, E. Caufield, E. Hesketh, and R. S. Phillips, was third with 98 per cent. Michel Nos. 3 and 8 teams obtained 96.2 and 95.8 per cent. respectively.

In the first-aid competition Coal Creek No. 1 team, captained by W. Cockburn, and Fernie No. 1 team, captained by J. Harner, each obtained 95 per cent. and decided first and second places by tossing; the other teams were: Fernie No. 2, 92 per cent.; Coal Creek No. 2, 91 per cent.; Michel No. 1, 87 per cent.; Michel No. 2, 87 per cent.; and Kimberley, 81 per cent.

In the ladies' first-aid event the first prize was gained by Michel team, composed of Misses Linda Causey (captain), Jean Moon, Mabel James, Ada James, and Emma Whalley, with 97 per cent.; while Fernie team, composed of Misses Anne Wilson (captain), R. P. Walker, D. Beale, D. Puckey, and B. Taylor, took second place with 94 per cent.

In the first-year event Michel team, captained by E. Rear, took first place and Fernie team, captained by Wm. Lewis, was second, while the first and second prizes in the junior competition were captured by Captain Deluca's Michel team and Captain Snow's Fernie team respectively.

The twelfth annual meet of the Vancouver Island and Coast District Branch of the British Columbia Mine Safety Association was held at Nanaimo on September 5th, and in point of interest was one of the most successful meets ever held in British Columbia. Teams were entered from Fernie, Britannia, Cumberland, Extension, Cassidy, and Nanaimo.

There were eight mine-rescue teams in the contest—one from Fernie, one from Cassidy, one from Extension, two from Cumberland, and three from Nanaimo.

Fernie team, captained by J. Caufield, and Cassidy team, captained by G. Hoggan, tied for first place, while Extension team, captained by James Galloway, was third. All the teams showed a high standard of training and excellent individual work on the part of the individual members, so that the placing of the teams was largely based on the method adopted in solving the problem set.

In the first-aid events the junior boys' team from Cassidy, under Captain R. Holmes, won first prize, while No. 2 team, Nanaimo, under F. Rutherford, gained second place, and No. 3 team, Nanaimo (Captain S. Wharton), was third.

In the junior girls' event Cassidy team, with Irene Hoggan (captain), gained first prize.

In the senior ladies' event two Nanaimo teams, captained by Mrs. Turner and Mrs. Sharp, gained first and second prize respectively.

The intermediate event was won by a Nanaimo team, under L. Wharton, and the one-man event by D. Simpson and J. Hindmarsh, first, and A. MacDonald and J. Houston, second; eight teams competed in this event.

In the two-man event the first prize was won by Messrs. Williams, Waterfield, and Watson, Cumberland, and second place by C. Wharton, W. Wharton, and P. Kemp; six teams competed in this event.

The Department of Mines cup was won by Cumberland team, captained by J. Williams, with Cassidy team, captained by J. Stewart, in second place; six teams entered this event.

The Coulson cup was won by a Nanaimo team led by Captain Stobbart, Cassidy team taking second place; five teams competed in this event.

The prizes were presented by the Honourable William Sloan, Minister of Mines, at the close of the competition.

The two mine-rescue and first-aid competitions, held annually, are made possible by substantial grants from the Department of Mines; in addition, the resources of the different mine-rescue stations are at the service of the meets.

The help of the Instructors at the different stations is also an important factor in the intensive training of the teams.

In June the Washington Safety Association requested the services of members of the inspection staff to act as judges at the mine-rescue and first-aid meet which was held at Burnett, Washington. The Honourable the Minister of Mines instructed Inspectors Dickson, Strang, Jackson, and Stewart to attend this event, which was very instructive in showing what is being done in this work to the south.

## EXAMINATIONS FOR CERTIFICATES OF COMPETENCY.

Two examinations for certificates of competency for coal-mine officials were held during 1927; details of these examinations are dealt with in the report of the Secretary to the Board.

Examinations for certificates of competency as coal-miners were held regularly during 1927 at the various mines.

## SUPERVISION OF COAL-MINES.

During 1927 fifteen coal companies operated twenty-one collieries, with thirty-seven mines, employing 3,646 men underground.

In the supervision of underground employees there were eighteen managers, two safety engineers, twenty-seven overmen, 150 firebosses and shotlighters, a total of 197, or one official for every nineteen persons employed underground.

## METALLIFEROUS MINES.

### Production.

The output from the metalliferous mines for 1927 was 5,319,384 tons, an increase of 544,311 tons over the tonnage for 1926. This tonnage was produced from 132 mines, of which fifty-two shipped 100 tons or more.

### Accidents.

There were eight fatal accidents in and about the metalliferous mines during 1927, a decrease of one compared with the figures for 1926.

There were 4,587 persons employed in and about the metalliferous mines in 1927.

The ratio of fatal accidents was 1.74, compared with 2.07 for 1926. The ratio for the last ten-year period was 2.03.

The tonnage mined per fatal accident was 664,920, compared with 530,564 tons per fatal accident for 1926.

The tonnage mined per fatal accident for the last ten-year period was 391,877.

The following table shows the mines at which fatal accidents occurred during 1927 and comparative figures for 1926:—

| Mining Division. | Mine. | No. of Accidents. | |
|---|---|---|---|
| | | 1927. | 1926. |
| Vancouver | Britannia | 3 | 1 |
| Slocan | Bosun | .... | 1 |
| Slocan | Noble Five | 3 | .... |
| Slocan | Carnation | .... | 1 |
| Fort Steele | Sullivan | 1 | 1 |
| Fort Steele | Stemwinder | .... | 1 |
| Greenwood | Rambler | .... | 1 |
| Similkameen | Copper Mountain | .... | 1 |
| Northern | Hidden Creek | 1 | 1 |
| Lillooet | Pioneer | .... | 1 |
| Totals | | 8 | 9 |

The following table gives the cause and percentage to the whole of the fatal accidents, with comparative figures for 1926:—

| Cause. | 1927. | | 1926. | |
|---|---|---|---|---|
| | No. | Per Cent. | No. | Per Cent. |
| By blasting | 1 | 12.50 | 1 | 11.11 |
| By falling into chutes, raises, winzes, etc. | 1 | 12.50 | 4 | 44.44 |
| By falls of ground | .... | ..... | 2 | 22.22 |
| Miscellaneous (underground) | 3 | 37.50 | 1 | 11.11 |
| Miscellaneous (surface) | .... | ..... | 1 | 11.12 |
| By falling cage | 3 | 37.50 | .... | ..... |
| Totals | 8 | 100.00 | 9 | 100.00 |

Details surrounding the occurrence of fatal accidents in and around metalliferous mines during 1927 were:—

The fatal accident which occurred to Guiseppi Podreca, chuteman, *Hidden Creek* mine, operated by the Granby Consolidated Mining, Smelting, and Power Company, on January 16th was due to the premature explosion of a charge. Podreca was in the act of charging a hole for "bulldozing" purposes, and according to the evidence the charge exploded while being inserted. The cause of this premature explosion was undetermined.

The fatal accident which occurred to T. Collodet, trammer, *Victoria* mine, operated by Britannia Mining and Smelting Company, on March 29th was due to suffocation. Collodet was engaged in drawing muck from a chute which hung up and then released itself with a rush, smashing through the doors and covering deceased with mud and muck.

The fatal accident involving the deaths of Olaf Beckman, miner; Harry Beckman, mucker; and Martin Nilson, mucker, in the *Noble Five* mine, Sandon, on April 22nd, was caused by the hoisting-rope breaking when they, together with another man, were being hoisted in a vertical shaft. The cage and men fell 150 feet.

This rope was a 6 by 19 Lang lay and was $\frac{5}{8}$ inch diameter; it was installed in this shaft at the end of 1919 and had been in intermittent use since that date, the actual time the rope was in service being about fifteen months. The cage weighed 1,500 lb. and was used for men and supplies, the ore being handled by transfer-chutes. The shaft is very wet and as the hoist is situated at the bottom of the shaft the rope was subjected to this water at all times.

Parts of the broken rope were sent to the testing laboratory, McGill University, and tests of parts near the break showed an ultimate strength of from 2,350 lb. to 12,600 lb. Two tests on parts of the rope away from the vicinity of the point of breakage showed ultimate strengths of 24,900 lb. and 27,500 lb. respectively. The results of the tests show that this rope was originally of good quality, but apparently corrosion had reduced the strength of the rope.

The Coroner's jury found that the accident was due to the "breaking of an unknowingly defective rope."

The fatal accident which occurred to L. Rodspeth, miner, *Fairview* mine, operated by the Britannia Mining and Smelting Company, on July 18th was caused by deceased falling into a glory-hole. There were several safety-ropes hanging at the place from where deceased fell, but he had not availed himself of this protection.

The fatal accident which occurred to Sam Ordahl, skip-tender, *Victoria* mine, operated by the Britannia Mining and Smelting Company, on September 3rd was apparently caused by being struck by a chute-door. Ordahl was found lying near the chute, which was found to be in good order, and it would appear that deceased had been trying to get a boulder through the door and had been struck either by the chute-door or by the crowbar he had been using; his neck was broken.

The fatal accident which occurred to John Moen, miner, *Sullivan* mine, operated by the Consolidated Mining and Smelting Company of Canada, on September 9th was caused by falling from a ladder. Deceased was using a small plugger-machine about 20 feet from the ground when the ladder from which he was working fell from position and broke, throwing Moen to the ground and fracturing his skull. The ladder had been insecurely placed at the bottom with only one side resting on the ground.

There was a total of twenty-eight serious accidents reported under the requirements of section 19, "Metalliferous Mines Regulation Act." A large percentage of the accidents were avoidable had proper care been exercised by the injured persons.

The more important mining companies have instituted safety-first work among their officials and employees, both by safety literature and local safety organizations.

### Mine-air Sampling.

During 1927, as in previous years, mine-air samples were frequently taken in the metalliferous mines of the Province; much valuable information has been obtained from the samples and added to that previously obtained relative to the hydrogen, carbon-monoxide, and carbon-dioxide contents of the atmosphere in the metalliferous mines.

### Mine-rescue Work.

Several of the larger mining companies have installed sets of the Burrell all-service gas-masks for emergency use in case of fires or dealing with noxious gases.

### First-aid Work.

Many of the employees of the more important mining companies have taken first-aid training during 1927 and in some instances competitions have been held to widen the interest in this work.

## CONCLUSION.

I desire to express my appreciation of the faithful co-operation and assistance afforded during the year by the District Inspectors and Instructors in mine-rescue work. I also wish to thank the management and employees at the various collieries for the assistance and support given in making operations as safe as possible and look forward to a continuation of the same during the coming year. It is only by the closest and efficient co-operation of all parties concerned that we can keep down the number of accidents and make the mining industry a safer and more congenial occupation.

I am much indebted to the Director of the Mines Branch at Ottawa for co-operation in the work of mine-air sampling, and the Dominion Government for furnishing the sample-bottles and making all analyses free of charge.

# REPORTS OF METALLIFEROUS MINES INSPECTORS.

## NORTHERN INSPECTION DISTRICT.

REPORT BY THOS. J. SHENTON, INSPECTOR.

I have the honour to submit my annual report for the year 1927 for the Northern Inspection District, including the following Mining Divisions: Atlin, Portland Canal, Nass River, Omineca, Queen Charlotte, Skeena, Bella Coola, Stikine, and Liard.

### ATLIN MINING DIVISION.

*Engineer.*—This mine is operated by the Engineer Gold Mines, Limited; Charles V. Bob, president, New York; L. P. Jubien, secretary; Arthur C. Brinker, manager, Engineer, B.C.; R. Hodgson, mine superintendent, Engineer, B.C.

During the fall of the year 1926 the mine ceased production to allow for certain improvements to be made in the mill, also to permit the further development of the interior of the mine in the sinking of the main shaft connecting No. 5 adit-level with Nos. 6, 7, and 8 levels below, giving an increased depth of 300 feet. Development-work, resulting in an increase of reserves of ore, was thus maintained through the winter months into the early spring of 1927, when operations recommenced.

Improvements to mill consisted of the installation of a travelling-belt or conveyor from the crushers and a new table. The mine ceased operation temporarily on October 7th and the entrances to workings of mine were fenced off and a watchman kept on the property during the temporary shut-down.

The average number of men employed a day was seventy-five. First-aid and safety-first work was well cared for and the management was requested to provide three sets of Burrell all-service gas-masks to take care of emergencies in case of gas or fire in shaft-timbers. There is a resident doctor and small hospital in camp. No accidents occurred during the year.

During my inspections the operations were found to be in accordance with the "Metalliferous Mines Regulation Act."

*Taku Arm.*—This mine is operated by Taku Arm Corporation Company; R. W. Foster, general manager; T. Oxley, superintendent. Early in the current year the general development of the workings of No. 2 level ceased to allow for the further work of sinking the shaft deeper. After reaching a depth of 300 feet orders were received on June 27th to cease sinking and take out the pumps until further orders.

During the temporary cessation of work I ordered all avenues to workings of mine to be fenced off, which was done. Copies of blue-prints of mine-survey were sent to the Chief Inspector of Mines. First-aid and safety-first work was well cared for.

The average number of men employed was eighteen and the operation carried on in strict compliance with the "Metalliferous Mines Regulation Act."

*Gleaner.*—Operated by the Gleaner Consolidated Mines, Limited; O. B. Smith, general manager; H. Butler, mine foreman. This mine did not operate during the year 1927.

*Atlin Silver Lead.*—Operated by the Atlin Silver Lead Mines, Limited; J. M. Ruffner, manager, Atlin. During the month of June an inspection of this mine was made by me. Previous to this time the operation had been carried on under lease to the Federal Mining and Smelting Company, but at the time of my visit the mine was directly operated by J. M. Ruffner in the interests of the Atlin Silver Lead Mines, Limited.

Shipping of ore began in the early part of the year and during the month of May some 30 tons of ore was shipped to Lake Atlin Landing by wagon. The work being executed at the time of my visit was the driving of a lower tunnel to intersect the ore-body developed by a winze of 45 feet depth sunk from Level 300.

Ventilation of the lower workings or No. 4 tunnel was being assisted with a small operating fan, but, however, to further improve the ventilation I requested that a raise be driven on the ore-body to connect with upper workings, with which the management agreed. Camp accommodation was found to be amply sufficient.

First-aid supplies were provided and a recognition of safety-first work given place in the arrangements by the management. There is a plentiful supply of good water and hospital provision can be had at the city of Atlin in case of serious accident.

*Discovery Placer.*—Operated by Discovery Mining and Power Company, Limited; A. Sostad, general manager. This is an open placer being operated by the hydraulicking method and at the time of my visit three large monitors were in action. There were twenty-seven men employed. Accommodation and sanitary conditions I found to be fairly good.

*Ruby Creek Placer.*—Operated by the Placer Gold Mines Company; J. P. Hartman, president; F. T. Fisher, vice-president; G. McLean, secretary-treasurer; C. H. Titus, manager. This is one of the most important underground placers of this district and is located about 20 miles north-east of the city of Atlin. At the time of my visit the main adit was in a distance of 1,135 feet, with an overburden of 150 feet. At present there is only one opening to the mine-workings, but a shaft had been sunk at some previous time in advance of the workings at a distance of about 125 feet and to a depth of 125 feet. The management made a connection with this shaft as a second opening to the workings and as a further aid to improve the ventilation which was being assisted by a blowing fan.

The tunnel is lighted with electricity. Timbering was found to be good and all conditions of operation to be in fair order. Camp accommodation was found to be ample and first-aid supplies were kept on hand by the management, while safety-first work was carried on in a satisfactory way.

## PORTLAND CANAL MINING DIVISION.

### Bear River Section.

*Independence.*—Operated by the Independence Gold Mining Company, Limited; S. Fitzgerald, general manager; C. Swanson, superintendent. This mine is situated some 15 miles in a northerly direction from the town of Stewart on the west side of Bear river. Operations have been continued throughout the year, with the exception of about two weeks in the month of June. Character of work pursued is that of tunnelling, crosscutting, and general development of the property.

In the main working, entered by No. 1 tunnel, ventilation conditions were found to be sluggish and inadequate. To remedy this condition the company was advised to drive a raise from the No. 2 tunnel immediately below to connect with the workings of the upper or said No. 2 tunnel. Timbering I found to be good and the mine as a whole in fair order.

The camp arrangements were found to be inadequate for the number of men employed. This matter was taken up with the management and remedied. All other matters of operation were found to be in accordance with the "Metalliferous Mines Regulation Act."

*Dalhousie.*—Operated by the Dalhousie Mining Company, Limited; C. Cameron, general manager; A. Kelly, superintendent. This mine is in close proximity to the *Independence* mine, being on the west side of the Bear river and at a distance of 13 miles from Stewart. Operations began about the middle of May and continued throughout the year. A new bunk-house was built for the accommodation of twenty-five men. The camp accommodation is therefore for the present both adequate and sanitary.

At the time of my last visit eight men were employed, chiefly stripping and tunnelling. Arrangements respecting the proper storage of powder were good. The ventilation of the mine was fair and the timbering good.

The general conditions of this operation were found to be satisfactory and in accordance with the requirements of the "Metalliferous Mines Regulation Act."

*Dunwell.*—Operated by the Dunwell Mines, Limited; R. Stewart, general manager; T. S. McPherson, vice-president; M. Little, superintendent; W. McNutt, mine foreman.

This mine was operated continuously with a crew of seventy-nine men until the end of November, when the mine and mill closed down. All entrances to mine-workings have been properly fenced off and copies of the plans sent to the Department of Mines.

In all my inspections of the mine operating conditions, including timbering of mine, ventilation, manways, camp buildings, first aid, and powder-storage, were found to be in accordance with the "Metalliferous Mines Regulation Act."

*Emperor.*—Operated by the Emperor Mines, Limited; Gustav Seiffert, manager. This mine is situated about 3 miles in a south-easterly direction from the *Dunwell* mine, on the east side

of the mountain ranges. On my last visit two men were employed in development of tunnel. The plant consists of semi-Diesel engine of 50 horse-power; an Ingersoll-Rand compressor with a capacity of 350 cubic feet, the compressor being coupled to the engine by belt arrangement; a Lemose sharpener; and an oil-tank of 10,000 gallons capacity.

In all my inspections of the mine operating conditions, including timbering of mine, ventilation, camp buildings, and first aid, were found to be in accordance with the "Metalliferous Mines Regulation Act."

*Ruth & Francis.*—Operated by James Nesbitt and Andy Archy, of Stewart. There were three men employed on this property until the end of October, when work was suspended owing to severe weather. General conditions were found to be good.

*L. & L.*—Operated by the L. & L. Consolidated Mines, Limited; J. H. Thomey, superintendent. Operations began during May and continued throughout the year. There were seven men employed during my last visit.

Development-work was being carried on by crosscutting, drifting, and raise. The upper tunnel was connected by raise from the lower tunnel. The general conditions in the mine were found to be good and in accordance with the "Metalliferous Mines Regulation Act."

*Albany.*—Operated by the Albany Mining Company, Limited. New camp buildings were constructed on this property during the year and adequate accommodation provided for the employees.

On one of my inspections at this mine some of the timbering was found to be inadequate. This was remedied and better provision made for the storage of explosives. In general the provisions of the "Metalliferous Mines Regulation Act" were well adhered to.

### Marmot Section.

*Silverado.*—Operated by the Silverado Mines, Limited; R. Stewart, general manager; John Stewart, superintendent; J. Haahti, mine foreman. This operation worked from March to June, when it closed down due to a break-down of the machinery. The operation recommenced on October 12th and closed down again at the end of October for the year.

During my last inspection eight men were employed and general conditions were found to be in keeping with the "Metalliferous Mines Regulation Act."

*Prosperity.*—Operated by the Premier Gold Mining Company, Limited; D. L. Pitt, general manager; B. Smith, assistant general manager; Gus Anderson, superintendent. This property is located on the North fork of the Marmot river, 7 miles from tide-water, at an elevation of 5,430 feet; operations commenced in June and continued throughout the balance of the year.

The work carried on is crosscutting and drifting. The average number of men employed was twenty. An Ingersoll-Rand compressor of 55 horse-power furnished necessary power for the drilling and general development-work being done. The bunk-house is a stone building, built from the natural mountain rock; it is divided into three compartments—bunk-house, store-room, and cook-house.

During my inspection conditions of ventilation, timbering, and accommodation for employees were found to be in accordance with the "Metalliferous Mines Regulation Act."

*Porter-Idaho.*—Operated by the Porter-Idaho Mining Company, Limited; D. Porter, general manager; Angus McLean, superintendent. This mine operated throughout the year with an average of twelve men; the work done being general development with a small amount of stoping. The lower tunnel has been driven in further development of the property and a new camp will be constructed and the old camp at tunnel No. 1 abandoned; the new camp will have a lower elevation than the old one by about 150 feet. Camp accommodation has been ample, though not of the most desirable character, but in the new camp the necessary improvements are included.

Owing to the strata being troubled with zones of loose sheared rock, timbering of the most careful character is required to sustain the hanging in stoping, and for this purpose I have consulted with the management in devising a system of timbering to meet the natural surrounding conditions in order that the operation may be safe.

In my inspection of this mine, while conditions of operations as a whole have complied with the requirements of the "Metalliferous Mines Regulation Act," there has been room for improvement.

*Marmot Metal.*—Operated by the Marmot Metals Mining Company, Limited; Angus McLean, superintendent. For about two months of the year this mine operated with a crew of three men, the character of the work being stripping and tunnelling.

Timbering in general is unnecessary owing to the hard character of the rock formation. General conditions were found to be in accordance with the "Metalliferous Mines Regulation Act."

*Washington.*—Operated by the Marlund Mines, Limited; A. H. Garman, general manager; R. E. Lundvall, superintendent. Operation of this property has been continuous throughout the year and the average number of men a day employed was ten. The character of the work being done is general development in crosscut tunnel and at the time of my last visit general conditions were found to be good.

*Harner-Ficklin.*—Operated by the J. Harner & Ficklin Company, Stewart; J. Harner, superintendent. This property operated for about three months of the year with an average employment of two men.

During my inspection general conditions were found to be in accordance with the "Metalliferous Mines Regulation Act."

### Portland Canal Section.

*Outsider.*—Operated by the Granby Consolidated Mining, Smelting, and Power Company, Limited; C. Bocking, general manager; W. R. Lindsay, general superintendent; J. Anderson, superintendent. A crew of thirty-eight men was employed at this mine until September, when the number of men was reduced for the remainder of the year. During my different inspections general conditions were found to be satisfactory.

### Salmon River Section.

*Woodbine.*—Operated by the Woodbine Gold Mining Company, Limited; Malcolm McKenzie, manager. Average number of men employed during the year was ten and an early improvement of the power plant was made, when a semi-Diesel engine, geared to a 3-drill compressor, was installed. Satisfactory improvements have been made to the accommodations for the employees and the general operations found to meet the requirements of the "Metalliferous Mines Regulation Act."

*Silver Tip.*—Operated by the Silver Tip Mining Company, Limited; J. V. Clegg, manager. A crew of three men was employed from July to September in stripping and tunnelling, and during my last inspection general conditions were satisfactory.

*Outland.*—Operated by the Outland Silver Bar Mines, Limited; F. C. Outland, manager. A crew of seventeen men was employed until the end of November. The power plant consists of a 45-horse-power Ingersoll-Rand compressor, portable type. The camp buildings were found to be inadequate; this matter was taken up with the management and the necessary improvements are under way. All other matters relating to the mine were in compliance with the "Metalliferous Mines Regulation Act."

*Silver Crest.*—Operated by the Silver Crest Mines, Limited; S. Campbell, superintendent. A crew of three men was employed during the month of August, when the mine closed. During my last inspection general conditions were satisfactory and in compliance with the "Metalliferous Mines Regulation Act."

*Big Missouri.*—Operated by the Buena Vista Mining Company; G. M. Warren, superintendent; E. D. O'Brien, mine foreman. The mine operated for the major portion of the year under the name of the Big Missouri Mining Company, when it was taken over by the new company mentioned above.

At the time of my inspection there were thirty-four men employed. A new house was being added to the camp buildings and other improvements were being made to the camp in enlargement of other buildings. An increase in the power plant had been made by the instalment of two portable compressors of the Ingersoll-Rand type.

In my inspection of the operation I found general conditions to be good and in compliance with the "Metalliferous Mines Regulation Act."

*Extenuate.*—Operated by the Bush Consolidated Mines, Limited; G. Bancroft, manager; W. Irvin, mine foreman. This property operated under the name of the Extenuate Mining Company in the months of May and June, during which time a reorganization of the company took place under the above name.

At the time of my last inspection eight men were employed and operating conditions with respect to timbering of the mine, ventilation, camp accommodation for the employees, first-aid work, and powder-storage were in compliance with the "Metalliferous Mines Regulation Act."

*Sebakwe.*—Operated by the Sebakwe and District Mines, Limited; C. A. Banks, general manager; C. B. North, superintendent; D. McRae, mine foreman. This mine operated continuously throughout the year with an average employment of fourteen men a day.

A new electric-lighting system has been added to the power plant. In this connection also a 20-horse-power mechanical motor or trammer was placed in operation to do the mine haulage, power being furnished by storage-batteries.

During my last inspection conditions with respect to camp accommodation, first aid, storage of powder, ventilation, and timbering of mine were in compliance with the "Metalliferous Mines Regulation Act."

*B.C. Silver.*—Operated by the B.C. Silver Mines, Limited; C. A. Banks, general manager; C. B. North, superintendent; G. Creighton, mine foreman. This mine operated throughout the year with an average employment of twenty men a day. Being close to the operation of the *Premier* mine, medical, first aid, and hospital provisions are within easy reach and are attended to by the resident doctor. Camp accommodation is of the modern type, ample and sanitary.

Timbering of mine, ventilation, and storage of powder are carefully supervised by the management, and in my various inspections of the year the operation was found to be in accordance with the "Metalliferous Mines Regulation Act."

*Premier.*—Operated by the Premier Gold Mining Company, Limited; D. L. Pitt, general manager; B. Smith, assistant manager; H. MacDonald, superintendent. This mine operated continuously throughout the year with an average employment of 330 men a day.

There was one serious accident during the year and with ordinary care this should have been avoided. A programme of safety first to prevent accidents has been pursued by the officials in charge, and the management is now considering the adoption of the block system of signalling in connection with the mine haulage to ensure a minimum of risk.

Considerable improvement has been made in the housing accommodation for the employees during the year. Provision for first aid is well in hand and a resident doctor is in charge of the hospital.

In all of my inspections during the year the operations were in accordance with the "Metalliferous Mines Regulation Act."

## NASS RIVER MINING DIVISION.

### Alice Arm Section.

*Wolf No. 2.*—This property is owned by John Stark, of Alice Arm, and is being operated under bond by J. Fiva, of Alice Arm. During my inspections the general conditions of this mine were in accordance with the requirements of the "Metalliferous Mines Regulation Act."

*Esperanza.*—This operation is owned by N. Fraser, of Alice Arm; G. Crosby, of Prince Rupert; and other associates. Operations began about May 20th and continued until the end of the year with an average employment of four men. I found timbering of mine rather inadequate, ventilation rather poor, which matters I took up with the management, who promised to remedy same. Provision for first aid has also been made. The camp was adequate but of poor type; this I also mentioned to the management, who promised to remedy same in the building of a new camp during the summer of 1928. In my inspection I found the management ready to agree to the remedying of matters mentioned.

*La Rose.*—This property has been idle the whole of the year.

*Eagle.*—Owned by the Kitsault-Eagle Silver Mines, Limited. This mine is situated about 8 miles from tide-water, along the Kitsault river, and during my inspection I found two men employed. I found the mine in safe condition, powder properly stored, ample camp accommodation, and operation in fair keeping with the "Metalliferous Mines Regulation Act."

*Toric.*—Operated by the Toric Mining Company, Limited; A. C. H. Gerhardi, general manager; H. Stratford, mine foreman. No work was being done underground at the time of my inspection. There were twenty-four men employed in the construction of the mill and the installation of the machinery; also with the instalment of the power plant, a distance of 1 mile south of the mine.

In my inspection of the mine I found timbering and ventilation to be fair, the latter further improved by an upraise to be driven from the workings to the surface at an early date. A request for a more spacious camp was also made by me and agreed to by the management. First-aid supplies are kept and the services of a first-aid man has been requested.

*Red Point.*—Operated by the Dolly Varden Mining Properties, Limited; J. Heidman, superintendent; W. McDonald, mine foreman. This mine is situated 24 miles from tide-water in the district of the Kitsault river. Operations began in the month of May and temporarily closed down about the last of September. There were nine men employed during this period of work. During my inspection the general conditions of this mine were in accordance with the "Metalliferous Mines Regulation Act."

*Copper Cliff.*—Operated by the Dolly Varden Mining Properties, Limited; J. Heidman, superintendent; J. Lawson, mine foreman. This mine is situated near *Red Point* mine and was operated by the same interests. During my inspection there were five men employed in driving a tunnel. Also found general conditions of this mine to be in accordance with the "Metalliferous Mines Regulation Act."

*Vanguard.*—Operated by the Dolly Varden Mining Properties, Limited; J. D. Heidman, superintendent; Neil Forbes, mine foreman. During my inspection there were employed eight men; also found general conditions to be in accordance with the "Metalliferous Mines Regulation Act."

*Silver Cord.*—Operated by the Kitsault Eagle Silver Mines, Limited; A. McGuire, superintendent; R. Lekich, mine foreman. This mine is located 7 miles from Alice Arm, on the north side of McGraw hill. During my inspection there were three men employed and the general conditions of the mine were in compliance with the "Metalliferous Mines Regulation Act."

*Keystone.*—Operated by the Keystone Mining Company, Limited; Roland King, manager. The mine resumed operation early in the month of July and work was carried on until November 10th, at which time the work closed down for the season. The main tunnel is now in 600 feet.

During my inspection I found timbering good; ventilation was maintained by a fan driven by a 2-horse-power gasoline-engine stationed at the entrance to the tunnel, and which gave great satisfaction in the way it cleared the working-face of smoke after blasting and in keeping up a fair current of circulating air. First aid and first-aid material I found furnished and the whole of the operation to be in fair compliance with the "Metalliferous Mines Regulation Act."

### Observatory Inlet Section.

*Hidden Creek.*—Operated by the Granby Consolidated Mining, Smelting, and Power Company; C. H. Bocking, general manager; W. R. Lindsay, general superintendent; J. A. Swanson, superintendent; J. McNicholas, assistant superintendent. This mine operated throughout the year with an average crew of 360 men and produced 1,369,065 tons of ore. The work of the mine is now of large dimension, operated chiefly under a system of glory-holes. The ore, lying in lenses, is attacked from its centre and mined out in circular form. The men are kept next the solid ground and close inside, near the extremity of the ore-body, rendering the highest possible degree of safety in such an operation.

Three sets of the Proto breathing apparatus are kept always in readiness for any emergency in case of fire or gas. All the large hoists are equipped with preventive overwinding apparatus, and each hoisting engineer must, before taking charge, be medically examined as to his physical condition and again at six-month intervals. Motormen and conductors are also required to pass medical examination before permitted to operate the mine-train. Whistles are used as signals in case of blasting near to the entrance to each glory-hole, at the surface, and shelters for the men are built to avoid falling pieces of debris. The mine haulage is controlled by the block-signal system. During all my inspections general conditions of the mine were in compliance with the "Metalliferous Mines Regulation Act."

*Golskeish.*—Operated by the Granby Consolidated Mining, Smelting, and Power Company; C. H. Bocking, general manager; W. R. Lindsay, general superintendent; J. D. Ferguson, superintendent. This mine is situated near Deep bay, 3½ miles south of Anyox. Operations have been continuous throughout the year, with an average employment of twelve men. During my inspection general conditions of the mine were in accordance with the "Metalliferous Mines Regulation Act."

## OMINECA MINING DIVISION.

*Kalum Lake.*—Operated by the Kalum Lake Mines, Limited. During the year there was no work done at this mine.

*Motherlode.*—Owned by Oscar Olander, of Terrace, and associates. This mine is located on Maroon mountain, on the east side and parallel to the head of Kitsumgallum lake, at an elevation of 5,560 feet. At the time of my inspection there were two men employed in driving a tunnel to develop the property. General conditions were found to be good and in compliance with the "Metalliferous Mines Regulation Act."

*Black Wolf.*—Operated by the Black Wolf Mining Company; J. M. Hoar, superintendent. This mine is located on the east side of the mountains at the head of Kitsumgallum lake, some 27 miles from the town of Terrace, and at an elevation of 4,400 feet.

During my inspection four men were employed in development-work on tunnel and the trail has been prepared for the shipment of ore. General conditions were good and in compliance with the "Metalliferous Mines Regulation Act."

*Little Beaver.*—Operated by the Hopper Davis Syndicate. During the year no work has been done at this mine.

*Halley.*—Owned by J. R. Smith and Mac Orr, of Cedarvale. This property is located at an elevation of 1,200 feet on the western side of the Seven Sisters mountains. At the time of my inspection there were two men employed in tunnel and stripping work. Also found general conditions of mine to be in compliance with the "Metalliferous Mines Regulation Act."

*D.W.*—Operated by the D.W. Mines, Limited; W. Davies, general manager; W. H. O'Connor, mine foreman. With the exception of a few days in February, this property continued operations throughout the year with an average employment of seven men a day. During my inspection general conditions of the mine were in compliance with the "Metalliferous Mines Regulation Act."

*Cordillera.*—Operated by the Kitselas Copper Mountain Company; J. Wells, general superintendent. During this year there has been no work done on this property.

*Doreen.*—Owned by J. W. Tredway and associates. There has been no work done on this property during the year.

*American Boy.*—Operated by the Harris Mines, Limited; W. Parsons, superintendent. This mine is situated on Four-mile mountain and began operation early in the month of September. During the latter part of December the mine closed down temporarily, due to an inflow of water in the workings.

At the time of my inspection four men were employed in development of a tunnel started at the foot of inclined shaft 275 feet deep. I found shaft insufficiently timbered, manway in very poor order, hoisting-rope unfit for hoisting men; these matters were immediately brought to the attention of the company and remedies required. Provision for first aid was arranged.

The superintendent informed me that he had no experience in mining; this made it necessary for me to request the company to appoint a practical mining man to have charge of the workings of this mine. This is the second instance in this field where I have found it my duty, in the interest of safety, to request a company to appoint a practical mining man to have charge of the workings of a mine.

*Silver Cup.*—Operated by the Duke Mining Company, Limited; W. D. Meurer, superintendent; W. Fraser, mine foreman. Operations began in the month of July and have been continuous throughout the year from that time, with an average employment of fifteen men a day.

Twenty-eight tons of ore was shipped to the Trail smelter and there is stored in the bunkers some 60 tons of ore ready for shipment. The haulage by sleighs is proceeding as fast as arrangements will allow. An aerial tram is in operation, being installed this year, and is about a mile long; operated by gravity.

During my inspection of the mine I found the timbering fair and ventilation good. The manway was not in proper condition; this I immediately requested to be remedied. Camp accommodation was adequate, first-aid material provided, care of storage of explosives attended to, and all other matters of operation in satisfactory compliance with the "Metalliferous Mines Regulation Act."

*Sunrise.*—Operated by New Hazelton Sunrise Mining Company; J. F. Ritchie, general manager; A. Harris, mine foreman. During my inspection of this operation there were five men employed in general development-work. Ventilation was fair, timbering good, and powder-storage in good order, but camp accommodation poor.

*Duthie.*—Operated by the Duthie Mines, Limited; J. F. Duthie, managing director; J. R. Turner, manager; A. Nelson, mine foreman. With the exception of a few days lost due to mill-construction and shortage of water, this mine operated throughout the year with an average crew of forty-five men.

No accident occurred during the year, which reflects much credit on those in charge. Much new work has been effected during the year; a new concentrator of 50 tons capacity has been constructed, with the instalment of necessary steam-boilers. A lower tunnel to tap the upper workings and to serve as the main haulage-tunnel for the mine at the level of the mill has been driven successfully, making two openings to the entire workings, affording a good manway for the men and aiding the ventilation very considerably. The company further plans the removal of the power plant from the higher level to the location of the mill and the building of a new modern camp early in the new year.

During my inspections I found the general conditions of the mine to be in accordance with the "Metalliferous Mines Regulation Act."

*Grouse Mountain.*—Operated by the Cassiar Crown Mining Company; G. Harris, manager. This operation commenced about the latter part of February and ceased temporarily on May 13th. During the time of my inspection there were six men employed.

A raise to connect the upper workings of the main tunnel was driven during this period of operation for the purpose of making two openings to the mine, and especially to assist the ventilation, which had reached the stage of stagnation.

The mine was well timbered and the ventilation much improved, due to a connection with the upper workings. All other conditions were found to be in compliance with the "Metalliferous Mines Regulation Act."

*Porcupine.*—Operated by the Porcupine Gold Fields Development and Finance Company, Limited; O. C. Thompson, general manager; N. D. Thompson, mine foreman. This operation commenced in February and continued work until the end of May. During my inspection there were seven men employed in stripping, winze-sinking, and tunnel-work. All other conditions were found to be in compliance with the "Metalliferous Mines Regulation Act."

*Richfield.*—Operated by the Standard Silver Lead Mining Company, Limited; W. H. North, general manager; B. N. Sharp, superintendent. Operations began early in the year and continued until July, at which time the option on the property was relinquished. During my inspection there were sixteen men employed. In my inspection of the mine I found conditions of timbering and ventilation to be fair and first aid provided for. All other conditions were found to be in compliance with the "Metalliferous Mines Regulation Act."

*Topley.*—Operated by the Topley Consolidated Mining and Development Company; F. H. Taylor, manager. This property is situated 8 miles in a northerly direction from the Topley Station on the Canadian National Railway. At the time of my inspection there were eight men employed in stripping and tunnelling. General conditions were in compliance with the "Metalliferous Mines Regulation Act."

*Taltapin.*—Operated by the Taltapin Mining Company, Limited. This mine is some 23 miles distant from Burns Lake Station on the Canadian National Railway, in a northerly direction. Some machinery was installed at this mine during the early part of February, and in September the mine closed temporarily and subsequently resumed work in November. There were three men employed.

*Trixie.*—Owned by Frank Patterson, of Refuge Bay; H. M. Woodworth, superintendent. At the time of my visit of inspection there were six men employed in tunnelling and general development-work on the property. The power plant consisted of a single-acting compressor, coupled to an engine by belt. All other conditions of the mine were in accordance with the "Metalliferous Mines Regulation Act."

*I.X.L.*—Owned by H. E. Denison and E. Wright. At the time of my visit this property was idle. I inspected the mine, which consists of short tunnels chiefly driven on the ore-bodies. I advised better timbering, which I found to be inadequate. All other conditions were in accordance with the "Metalliferous Mines Regulation Act."

# SOUTHERN COAST INSPECTION DISTRICT.

Reports by Jas. Strang and Thos. R. Jackson, Inspectors.

## VANCOUVER MINING DIVISION.

Report by Thos. R. Jackson, Inspector.

*Britannia Mining and Smelting Co.*—C. P. Browning, general manager; James I. Moore, superintendent; C. V. Brennan, assistant superintendent; John Sleeman, mine foreman; C. G. Dobson, mine foreman of *Victoria* mine. The mines operated by this company are situated near Howe sound, about 30 miles north of Vancouver, and are several miles inland.

The 2,700-foot haulage-tunnel, driven from both ends, made a perfect connection on April 17th, 1927, one year and eleven days after starting. Since then enlargement of the small section has been done and the tunnel extended to the *Fairview* mine, making the total length 11,222 feet. Ore produced from all of the mines will be handled through this tunnel.

The number of men employed at the mine is about 800. The ore broken during 1927 was 432,483 tons and the mine production of ore was 1,349,591 tons. Mine-development was as follows: Total cutting, 20,483 feet; drifting, 8,101 feet; crosscutting, 2,686 feet; raising, 5,989 feet; sinking, 572 feet; diamond-drilling for the year was 11,016 feet.

The new crushing plant is being constructed below the 2,700-foot level in the Armour tunnel. This plant will contain a 36 by 48 Buchanan jaw-crusher. On the level above the crusher a rotary dump is being installed to handle the 20-ton cars.

A new wing-raise has been driven from the 3,250-foot level, connecting the new crusher location with the 4,100-foot raise, through which the ore passes to the concentrator level. All of the above new construction-work will be completed and in operation about February 15th, 1928.

The mine safety council was reorganized and embodies one executive council, the membership comprising foreman and heads of departments; ten local workmen's councils, with shift-bosses as chairmen; and nine men selected, three each month, as transient members. Starting April 1st, 1927, a safety bonus system was inaugurated and operated for the remainder of the year. This system provided cash awards to the members of certain competitive groups which showed the best accident records during each three-month period. This scheme is being discontinued on January 1st, 1928, with the substitution therefor of some other means of stimulating interest in safety first.

Three fatal accidents occurred at the mines during the year.

During the visits of inspection in 1927 I found the general conditions of the mines to be good; workings well ventilated and timbering good. Complaints were promptly attended to and safety-first suggestions equally considered.

Through the year considerable time and attention has been devoted to inculcating safety-first ideas into the minds of the workmen by the different officials in charge of mining operations. This is accomplished in different ways, but chiefly by means of literature, meetings, and verbal statements urging and inducing all employees to be careful in what they do while at work, and thereby help to avoid accidents.

Workmen and officials in their respective vocations have been attentive in carrying out the provisions of the "Metalliferous Mines Regulation Act."

*Clayburn Co., Ltd.*—Head office, Vancouver; J. W. Ball, manager; Edward Wilkinson, mine manager. This company's kilns and pits are situated about 50 miles east of Vancouver. The mines are at Straiton and Kilgard. The clay is hauled to the kilns at Clayburn, a distance of 3½ miles, by an electric motor with a crew of two men. From the Kilgard bunkers an endless-rope and gravity system is used to lower the clay down to the chutes, a distance of about 2,500 feet. The mines were found to be well ventilated and in a safe condition.

The total tonnage of all clays mined underground for the year ended December 31st, 1927, was 24,248 tons. From the open working there were 2,111 tons. Total number of men employed in the mines was twenty-three. An electric 30-horse-power hoist is in use at Straiton mine; other mines are operated by hand and grade. The same men are used to operate open and underground workings. There were no accidents at this operation this year.

## QUATSINO MINING DIVISION.

REPORT BY JAS. STRANG, INSPECTOR.

*Coast Copper Co., Ltd.*—C. A. Seaton, superintendent. The property of this company is reached by auto-road from Jeune Landing, where a new wharf has been completed this year, on the South-east arm of Quatsino sound, to Alice lake, by crossing that lake by gasoline-launch; thence 3½ miles by auto-road to the north end of Kathleen lake, by gasoline-launch to the south end of the lake, and then about 1½ miles by trail to the south-west shore of Elk lake, where the mine is situated.

During 1926 the company installed at Raging river a 1,000-cubic-foot Ingersoll-Rand 2-stage air-compressor. It is controlled by a Pelton governor and driven by a 3-foot Pelton wheel working under a 165-foot head and using 900 cubic feet of water a minute. The machine is automatic in all details except oiling. The air is conveyed to the mine, a distance of 3,300 feet, by a 4-inch pipe-line. At the old plant enough power is generated for electric lights, general camp use, and for a sawmill.

In the early development-work on this property a tunnel known as the 500-foot level adit was driven 452 feet from the surface and a winze sunk at a dip of 30° to a depth of 500 feet. At this level a new crosscut adit was driven from the surface, known as the 800-foot tunnel; this is the main haulage-adit and is 2,100 feet in length. A winze is sunk from this tunnel at a dip of 45° to the 1,200-foot level. At the 1,000- and 1,200-foot levels drifts are driven in a northerly and southerly direction, but at the present time only the drifts to the south are advancing. A total of twenty-nine men is employed underground. Practically no timber is required in this mine, ventilation is good, and every effort is made by the management to comply with the "Metalliferous Mines Regulation Act."

It is very satisfactory to report that no serious accident occurred during the year. The accommodation for the workmen, bunk-houses, cook-houses, and change-room is good, being sanitary and clean.

During the year drifting, crosscutting, etc., was as follows: Drifting, 2,229 feet; cross-cutting, 485 feet; raising, 64.5 feet; sinking, 337.5 feet; diamond-drilling, 641 feet.

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## NICOLA-PRINCETON INSPECTION DISTRICT.

REPORT BY JOHN G. BIGGS, INSPECTOR.

I have the honour to submit my report as Inspector of the Metalliferous Mines operating in the Nicola-Princeton Inspection District for the year ended December 31st, 1927.

*Copper Mountain.*—John McLaughan, superintendent; Steve Swanson, foreman. This mine is situated in the Similkameen Mining Division, 12 miles west of the town of Princeton, and has been in active operation during the whole of the year. It is by far the largest metalliferous operation in the district, and not only an aggressive policy of development has been followed underground, but an ambitious programme of construction and installation of machinery has been the order at the mine camp and the crushing plant during the year.

A new ore-bin, crusher plant, and sorting and conveyor belts have been installed near the entrance to the main haulage, or the 3,750-foot level, which doubles the storage capacity and operating in conjunction with the new coarse-crushing plant and sorting-belt from which the waste is taken, and enables this company to increase the grade of the ore at the flotation-mill at Allenby. This large installation is built on a concrete foundation provided with large abutments, is modern in every respect, and is provided with ample floor-space, making it manifest that consideration has been made with a view to ensuring the safety of the employees.

For the purpose of increasing the accommodation for the employees a large and commodious three-story building, following practically the same design as the present one in use, has been erected at this camp during the present year. It is modern in every way as regards fire-protection and heating facilities and is described as a three-story building built on a concrete basement the whole area of the floor, and provided with baths, lockers, and large wash and change room. The first floor contains a large hallway and fourteen double bedrooms; the second floor contains fifteen bedrooms and the third floor also contains fifteen bedrooms, each of which is provided with steam-radiators and so arranged that the occupants may regulate the

heat as required. The whole building provides accommodation for eighty men. The front of the building is encompassed by a large two-floor verandah supported on large pillars at the front of the building. The whole building is painted on the inside and out in pleasing colours, making a beautiful and commodious building. This is built in line with the one already in use and gives the camp a permanent and pleasing appearance.

There has been no change made with the power plant during the year, and descriptions of the mine and the various plants have been given from time to time, more especially by P. B. Freeland, the Resident Mining Engineer of this district, making it unnecessary to describe it here as these previous reports are all available for reference. The mine is well supervised and attention given to matters that pertain to the safety of the employees. The main haulage-roads are of ample width and well illuminated by electric lights strung along the main levels. The block system of signalling is in use on the No. 2 or the main operating level, where most of the ore is loaded into the ore-trains from the different chutes, a larger portion of the production being taken from the glory-holes during the summer months.

The accommodation of the employees is well provided for by a well-furnished mess-house with a large seating capacity; also billiard-room, store, library, and well-appointed reading-room, provided with a large collection of newspapers and magazines; while a well-equipped first-aid room is maintained under the supervision of a first-aid man who is on duty at all times. A doctor, residing at the town of Princeton, pays several visits to the camp during the week and at any time his services may be required.

During my visits of inspection I have generally found the mine to be well supervised and in good condition; the roof and sides of the stopes well barred down; and a good supply of safety-ropes for the miners employed in the glory-holes; also the provisions of the "Metalliferous Mines Regulation Act" well adhered to.

*Nickel Plate.*—G. P. Jones, general manager; Wallace Knowles, mine foreman. This mine is situated on Nickel Plate mountain at an elevation of 5,500 feet, 3,800 feet above the town of Hedley. This is a slope operation, the ore being in an andesite gangue found lying in lenticular bodies of a very hard nature; worked by underhand stoping, with some of the stopes reaching an unusual size. Most of the ore recovered during the year has been from the stopes lying between the Nos. 13 and 15 levels off the main slope.

The roofs of the stopes are kept well barred down and cleaned in the early stages of mining before the lower portion of the ledge is mined; the ore is loaded at the foot of the chutes into small mine-cars and trammed by hand to the ore-pockets, situated immediately above the slope, where it is drawn off as required into 2-ton slope-skips and hoisted to the top of the slope by a double-drum air-hoist and dumped into a large ore-bin, loaded into a train of cars, hauled by electric-trolley motors to the top of the surface incline, and again dumped into a large ore-bin. From here it is drawn off into 5-ton skips, operated on a gravity-plane 10,000 feet in length, in two sections to the mill at Hedley.

A 2,000-horse-power hydro-electric power plant is situated on the Similkameen river, a short distance below the town of Hedley, and provides power for the mine and the mill; while an auxiliary steam plant, consisting of three return-tube boilers and a single Goldie-Corliss engine, direct-coupled to a 375-kw. generator, is provided for emergencies.

During the year an active diamond-drilling programme has been followed underground in this mine, while fairly extensive exploration of other properties in the immediate district has been carried out with the purpose of discovering other new mines.

During my inspections the general conditions of this mine were very good, well supervised, and the "Metalliferous Mines Regulation Act" well adhered to.

*Iron Mask.*—This mine is situated 7 miles west of the city of Kamloops, at an elevation of 3,600 feet, and there is a good wagon-road to the camp. The *Iron Mask* shaft, situated at the mill, is used for the operating shaft, while the *Erin* and the *Norma*, situated to the east, are provided with ladder-ways and are used for ventilation purposes. A fairly large amount of exploratory and development work has been done at this mine during the year by way of drifting and diamond-drilling, while the flotation plant has been in operation during the larger part.

Electric power, brought from the city of Kamloops, is used for these operations. Good accommodation is provided for the employees and during my last visit of inspection there were sixteen men employed underground and eight at the surface. The camp and mining operations were in compliance with the "Metalliferous Mines Regulation Act."

*Cotton Belt.*—B. F. Lundy, superintendent; M. Kincella, mine foreman. This mine is situated in the Seymour River area at the head of Shuswap lake and at an elevation of 6,000 feet. This company has followed an aggressive policy of development by drifting and cross-cutting, along with diamond-drilling, on a well-defined lead for the purpose of proving continuity of the ore with depth during the greater part of the year. A small power plant is installed near the entrance to the tunnel and used for the purposes of development. It consists of a 25-horse-power Petters Diesel engine used for operating a belt-driven compressor.

This company is to be complimented for the excellence of the buildings erected at the camp for the use of the employees. They consist of a good-sized cook-house, kitchen, and large bunk-house. During my last visit of inspection there were six men employed underground and four men at the surface. General conditions in and around the mine were satisfactory and in keeping with the provisions of the "Metalliferous Mines Regulation Act."

*Pioneer.*—David Sloan, superintendent; Robert Sloan, mine foreman. This mine is situated 50 miles north of Shalalth, a small settlement situated on the Pacific Great Eastern Railway, 15 miles west of the town of Lillooet, and is reached by a fairly good road passing through the Bridge River district. It is at present the largest and most important development in the district.

This is an inclined-shaft operation from which the ore is drawn by means of skips, having a capacity of 1,300 lb., operated by a small 6 by 8 Jencks air-hoist. The production of ore has been substantially increased during the present year, and owing to the promising conditions underground work of equipping the mine with new plant and machinery has progressed rapidly and it is expected that operations on a considerably larger scale will be commenced early in the year 1928. A new vertical 4½ by 9 double-compartment vertical shaft, well timbered with 8 by 6 framed sets, is being raised from the 600-foot level. It is about completed and will replace the present incline shaft, which at best is far from satisfactory. The new shaft will provide for an increased output and will make two separate openings into this mine. It will not be driven direct to the surface, but will connect with an adit-level, driven from the side of the hill, where a large chamber will be prepared for the erection of the head-frame and the mine-hoist.

A new compressor plant consisting of a 2-stage Ingersoll-Rand compressor, having a capacity of 1,700 feet of free air a minute, driven direct by a 72-inch Pelton water-wheel, has been installed in the mill building, while 6,000 feet of 3-foot wood-stave pipe has been installed along the bank of the river and will replace the old flume. This provides a head of 260 feet at the mill and is expected to provide ample power for operating the compressor plant and also four Tuttall water-wheels which will be used for power for the mill machinery. The mill appears modern in every respect and contains a 100-ton cyaniding treating plant, which is almost completed and will be in operation during the early part of the year.

It is also pleasing to note that the camp accommodations have progressed in line with the improvements at the mine. During the year a 30- by 50-foot two-story rooming-house has been erected at the camp and is provided with ten bedrooms on the upper floor and five bedrooms and reading-room on the lower-floor; also a 24- by 24-foot "lean-to" is provided with shower-baths and a change-room, while four small bungalows have been built near the camp during the year for the use of the married employees.

During my last visit of inspection there were twelve men employed underground; also found the general conditions of the mine to be fairly good and the provisions of the "Metalliferous Mines Regulation Act" well complied with.

*Coronation.*—Malcolm McGregor, superintendent. This mine is situated in the Bridge River district, about a mile south of the *Pioneer* mine. It is developed by a 4- by 8-foot well-timbered vertical shaft with two compartments, in which is operated a steel cage, provided with safety-catches, by a small 6- by 9-foot Lidgerwood compressed-air hoist, situated in a large underground chamber at the terminus of the main adit-drift; all the operations at the present time being about the 100-foot level.

An ample supply of hydro-power is provided by the Cadwallader creek, which runs in close proximity to this property, and during the year 1925 930 feet of wood-stave pipe 3 feet in diameter was laid up the creek and under a head of 45 feet provides 140 horse-power, which operates a Pelton water-wheel situated in the mill and provides ample power for the air-compressor and the mill machinery.

During my last visit to this mine there were seven men employed underground; also found the general conditions of the camp and the mine operations to be in keeping with the requirements of the "Metalliferous Mines Regulation Act."

*Homestake.*—W. L. Bell, superintendent; A. Kiedler, mine foreman. This mine is situated near the road leading from Louis creek to Squaam bay, in the North Thompson River district, and is a small operation working a silver-ore vein pitching into the side of the mountain at an easy inclination and overlaid by a laminated talc-schist having little cohesion, and, as a result, this operation requires very careful timbering. Framed sets well lagged above and braced were in use at the working-faces and the roads of this mine. During the last inspection there was a small crew of men employed and the ore was shipped direct for treatment; also found conditions to be fairly satisfactory and the provisions of the "Metalliferous Mines Regulation Act" well adhered to. Operations were suspended during the latter part of the year.

*Queen Bess.*—O. H. Thomas, superintendent. This mine is situated near Auldgirth, a flag-station on the Canadian National Railway in the North Thompson River district, at an elevation of 1,300 feet. The mill and the power plant is situated on a flat at the foot of the hill and has been inactive for a number of years until taken over by the Queen Bess Mining Company, when an active programme of development and installation of the necessary power plant was followed for a few months.

During the year a large amount of new machinery was installed at the power plant, a new cement tank built at the side of the hill above the mill, the camp buildings and mill renovated, new rails and cable installed on the surface incline, and the roads of the mine cleaned and new track provided; while a fair amount of exploratory work by drifting has been done in the mine.

The new power plant chiefly consists of two tubular boilers having an aggregate of 256 horse-power, while a new steam-driven Ingersoll-Rand air-compressor, having a capacity of 600 feet of free air a minute, has been installed at the power plant. This power is transmitted to the mine by a 4-inch air-line running along the side of the incline to the mine and is chiefly used for driving the drilling-machines. During my inspection there were sixteen men employed in the mine and two at the surface; also found the mine to be in good condition and every attempt made to comply with the provisions of the "Metalliferous Mines Regulation Act." However, for some reason these operations were again suspended during the month of October.

## WEST KOOTENAY AND BOUNDARY DISTRICTS.

REPORT BY H. H. JOHNSTONE, INSPECTOR.

I have the honour to submit my annual report as Inspector of Mines for West Kootenay and Boundary Districts for the year 1927.

The mines in the Slocan Division are included in this report up to and including the month of June. After that date they were inspected from the Fernie office.

### TRAIL CREEK MINING DIVISION.

The Rossland properties operated by the Consolidated Mining and Smelting Company were the *Le Roi* and *Centre Star*. An average force of 102 men, under the superintendence of F. S. Peters, was employed in and about the mine. Considerable development was done and quite a tonnage of ore extracted.

The *O.K.*, *Midnight*, and *Golden Drip* in the free-gold belt on Little Sheep creek were operated by small forces of leasers.

### NELSON MINING DIVISION.

The *Yankee Girl* at Ymir was operated by the Yankee Girl, Limited, with W. G. Norrie as superintendent. An average force of thirty-one men was employed. Later in the year this property was operated under bond by the Porcupine Gold Fields Development and Finance Company, Limited, with O. C. Thompson in charge of the work. A raise was completed, connecting the lower tunnel with the upper workings.

The *Goodenough*, situated on Wildhorse creek, was idle for some months, but was operated later by the Goodenough Mines, Limited, with O. D. Frith in charge of the work. Seventeen men were employed.

The *Hunter V.*, on Porcupine creek, owned and operated by the Consolidated Mining and Smelting Company, built a new tramway. After the completion of the tramway operations were resumed in the mine. Eighteen men were employed.

The *Howard*, on Porcupine creek, operated for the greater part of the year on development. Nine men were employed.

The *Valparaiso*, at Ginol's, on Kootenay lake, operated during the most of the year. The work consisted principally of open-cuts and cleaning out and retimbering old tunnels.

The *International* and *Drumlummon* groups on the Pend d'Oreille river were operated by the Victoria Syndicate, Limited, with M. O'Donnell in charge of both properties. The work consisted entirely of development, and an average of nineteen men was employed on the property by Reeves and McDonald.

The *H.B.*, on Deer creek, was operated for part of the year by the owners. Ten men were employed.

The *Kootenay Belle*, on Sheep creek, was operated with an average force of eleven men. Power was installed for drilling purposes and a tramway was built from the mine to the wagon-road on Sheep creek. Frank Phillips was in charge of the work.

The *Alexandria*, on Wolf creek, a tributary of Sheep creek, was worked for part of the year, operations starting in the fall. This is one of the free-milling gold properties of Sheep creek. The ore is being milled at the *Queen* mill. Six men were employed.

The *Queen* was operated for a short time. The work consisted principally of unwatering the shaft for the purpose of examination. Seven men were employed.

The *Molly*, on Lost creek, was operated for a few months by the Consolidated Mining and Smelting Company. The work consisted of a tunnel and open-cuts, preparatory to an extensive programme of diamond-drilling, which was afterwards carried out. Three men were employed.

## AINSWORTH MINING DIVISION.

The *Bluebell*, at Riondel, was worked for the greater part of the year. It is being operated by Fowler & Eastman under a lease from the owning company. Charles F. Sherwin is mine foreman. An average force of fifty-one men was employed.

The *Cork-Province* was operated for part of the year, the work consisting of development. Nine men were employed. W. Burgess, of Kaslo, was superintendent.

The *Whitewater Deep* was operated continuously with an average force of twenty-four men. Large shipments of clean ore and milling-ore were made. A concentrating-mill has been added to their equipment. W. Burgess, of Kaslo, was superintendent and D. S. McLellan mine foreman.

The *Gibson* was operated throughout the year by the Daybreak Mining Company.

The *Florence*, at Princess creek, has been worked on an extensive scheme of development. A long operating tunnel is being driven from just above the level of the mill. This, when finished, is to be connected with the upper workings by a raise, thus furnishing a means for the more economical handling of the ore. An average force of seventeen men was employed.

The *Highland*, owned by the Consolidated Mining and Smelting Company, was operated by leasers for a few months.

The *Spokane-Trinket* was operated under lease by McPherson & Bridge.

The *Banker* was operated by leasers for part of the year. The Consolidated Mining and Smelting Company is now operating it under lease and bond.

The *Glacier Creek* group on Glacier creek, Duncan river, was operated in a small way.

The *Surprise*, also on Glacier creek, was worked during the summer months. Five men were employed.

## TROUT LAKE, LARDEAU, AND REVELSTOKE MINING DIVISIONS.

The *True Fissure*, on Great Northern mountain, near Ferguson, was operated throughout the year by the True Fissure Mining Company. D. Morgan was in charge of the work. Ten men were employed at the mine and a large force on the construction of a wagon-road.

The *Mohican*, on Gainer creek, operated during the summer months. The work consisted of the advancing of the lower tunnel. Six men were employed.

The *Champagne* group, at Poplar, was worked by the owners.

The *Silver Creek* group, on Silver creek, near Albert canyon, was operated by the Bernier Metals Company; F. F. Hill, manager. A compressor was being installed at the time of my last visit to the property. Seven men were employed.

The *Snowflake*, on Silver creek, was operated by the Snowflake Mining Company. Thirteen men were employed.

The *Teddy Glacier* group, on Teddy Glacier mountain, at an elevation of 7,500 feet, owned by the Teddy Glacier Mines, Limited, was late in getting started to work owing to the inaccessibility of the property. Seven men were employed at the mine. Preparations were made to continue the work throughout the winter months.

The *Paymaster*, on Rapid creek, above Camborne, was worked in a small way.

## GREENWOOD AND GRAND FORKS MINING DIVISIONS.

The *Sally*, operated by Sally Mines, Limited (E. Nordman, superintendent), employed a force of twenty-seven men. They worked continuously on development and production.

The *Bell*, owned and operated by McIntosh & Lee, was worked throughout the year. A force of nineteen men was employed.

The *Wellington*, owned and operated by the Wellington Syndicate (A. J. Morrison, superintendent), worked continuously with a crew of ten men.

The *Laurion* is situated on Cranberry mountain, a short distance west of the Kettle Valley Railway and about 3½ miles south of Beaverdell. Operations were started late in the fall. Four men were employed.

The *Bounty*, owned and operated by P. Stanhope, employed a force of four men for the greater part of the year.

The *Rambler* was operated under lease by George M. Barrett, a force of four men being employed.

The *Gold Drop* was worked for part of the year under the direction of W. McIntominey. A force of four men was employed.

The *Beaver*, operated by the Beaver Silver Mines, Limited, with Roy Clothier as superintendent, worked for the greater part of the year. Seven men were employed.

The *Advance* was worked for a few months. Five men were employed.

The *Providence*, at Greenwood, employed three men at unwatering the shaft for the purpose of examination. An examination was made in December by representatives of the Hecla Mining Company and work is to be started early in 1928. They purpose abandoning the old shaft as a working-shaft and sink a new one farther down the hill.

The *Elkhorn*, at Greenwood, is an old property which has not been operated for a long time. Work was started about November 1st on a crosscut tunnel. The work was started by hand, but, finding the rock to be too hard for hand-drilling, a compressor was installed.

The *D.A.*, situated in the Deadwood camp, Greenwood, was operated by the J.R. Mining Company, Limited; James Skelton, superintendent. Four men were employed on tunnel work.

The *Spotted Horse* was worked for a short time. Four men were employed.

The *Union* is situated in Franklin camp and is under bond to the Hecla Mining Company. Work was started late in the fall under Paul H. Schultz. Owing to the late date of their starting operations and the bad condition of the roads I have been unable yet to visit this property, but will do so at the earliest opportunity.

## SLOCAN MINING DIVISION.

These properties have not been inspected by me since June, as after that date they were inspected from the Fernie office.

The *Slocan Star*, owned and operated by the Silversmith Mines, Limited (O. V. White, superintendent), was operated principally on development-work. A force of thirty men was employed.

The *Ruth-Hope*, operated by the Victoria Syndicate (J. Hanna, superintendent), worked continuously on development and production. Thirty men were employed.

The *Sovereign*, operated by the American Boy Mining Company (J. Vallance, superintendent), worked on development and ore production. Five men were employed.

The *Carnation*, operated by the Victoria Syndicate (Logan McPhee, superintendent), worked continuously on development-work. The long tunnel connecting the Sandon side of the hill with 4-Mile creek on the Silverton side was completed. The idea is that the ore from the *Carnation* should be brought to the Silverton side through this tunnel and trammed to the *Hewitt* mill for

treatment. Twenty men were employed. New bunk-houses were built and increased power was provided by the installation of a larger compressor.

The *Minnehaha* was operated by the Victoria Syndicate. A large amount of development-work was done and some ore extracted. Eight men were employed.

The *Noonday* is owned and operated by the Leadsmith Mines, Limited; E. O. White, superintendent. Development consisted of a long crosscut tunnel and drifts on the vein. Six men were employed.

The *Noble Five* was operated under lease by Paul Lincoln. Twelve men were employed.

The *Wonderful*, owned and operated by Clarence Cunningham, was worked off and on. At the time of my visit ten men were employed.

The *Hewitt*, operated by the Victoria Syndicate, was worked continuously with a force of thirty-four men. W. Tattrie was superintendent. A new tunnel was started to gain a couple of hundred feet more depth on the vein.

The *Mammoth* was operated under bond by the Porcupine Goldfields Development and Finance Company. Twelve men were employed on development and some ore-extraction.

The *Bosun* is owned and operated by the Rosebery-Surprise Mining Company; J. P. MacFadden, superintendent. A shaft was sunk from the bottom of the main tunnel. Ore was encountered and drifted on both ways. Development has been carried on and a large tonnage of ore extracted. Nineteen men were employed.

The *Galena Farm*, operated under lease by J. Johnson and associates, worked continuously with a force of five men. A large tonnage of ore was produced.

The *Molly Hughes* was operated by the Kinkora Mining and Milling Company; H. Dimmick, superintendent. Work was intermittent because of lack of power. Thirteen men were employed at the time of my last inspection.

The *Lucky Jim*, operated by the Lucky Jim Lead and Zinc Mining Company (A. G. Larson, manager; J. P. Lane, superintendent), worked throughout the year. Twenty-one men were employed.

There was one fatal accident, resulting in the death of three men through the breaking of a rope in the *Noble Five* shaft.

Conditions in and about the mines inspected have been found to be good and the requirements of the "Metalliferous Mines Regulation Act" well adhered to. Any infringements of the Act have been through ignorance of rather than a desire to evade the requirements of the Act. Such infringements, when drawn to the attention of the management, have been corrected, and generally a desire on the part of the management to live up to the requirements of the Act and co-operate with the Inspector has been evinced.

## EAST KOOTENAY, WEST KOOTENAY, AND BOUNDARY INSPECTION DISTRICTS.

Report by Robert Strachan, Senior Inspector.

I have the honour to submit the annual report covering the metalliferous mines in the Kootenay-Boundary District for the year 1927.

During the early part of the year the work of inspection in the West Kootenay and Boundary District was covered by H. H. Johnstone, Inspector of Mines, with office in Rossland, but owing to the increase in the work and with a view to increasing the number of inspections, in the latter part of the year H. E. Miard, Inspector of Mines, and member of the Board of Examiners, took over the inspection-work in the Slocan District.

In the East Kootenay District the work of inspection in the early part of the year was carried out by John MacDonald and myself, and in the latter part by H. E. Miard and myself. This arrangement, I feel, will allow not only of more frequent inspection, but also allow us to take in many of the smaller operations, which formerly were not included in the inspection. This change was necessary as the number of mines which came under inspection has increased from thirty-eight in the year 1924 to seventy-four during the present year.

The work of inspection could be facilitated if many of the mine operators, leasers, etc., would comply with section 20 of the "Metalliferous Mines Regulation Act," as to giving notice of the opening of any new mine and when the working of a mine is abandoned. Failure to give any

notice makes it extremely difficult to keep in touch with many of the smaller operations, and we often find that the regulations *re* blasting are not carried out. Under these regulations, it almost seems necessary that we should get early notice, so that provision can be made for the inspection and approval of explosive magazines and the granting of blasters' certificates. We feel that this evasion of the regulations is not done intentionally, but more through ignorance of their existence.

## WEST KOOTENAY AND BOUNDARY DISTRICT.

In this district sixty-five mines came under our inspection during the year and the general conditions with respect to safety and health have been very well maintained. The "Metalliferous Mines Regulation Act" has been fairly well complied with and in the larger operations the blasting regulations have been carried out very satisfactorily.

In many of the smaller operations, the number of which are gradually increasing year by year, we had occasion to draw their attention to sections in the blasting regulations, and we found a very ready response in adapting their operations to comply with these.

The report attached by H. H. Johnstone, Inspector of Mines, covers this district very fully.

During the year the number of men employed in and around the mines has increased to a small extent, but the indications are that the increase will be greater during the year 1928.

In many of the mines, especially in the Slocan District, mining has been curtailed, pending the erection of concentrators, so as to be able to deal with larger productions more economically.

The *Lucky Jim* and the *Whitewater* both erected new concentrators, while the *Ruth-Hope* and the *Hewitt* reorganized their concentrators. Work on these was completed by the end of the year and will be of advantage during the year 1928.

## EAST KOOTENAY DISTRICT.

In this district twelve mines came under our inspection during 1927, as compared with nine in the previous year.

The *Sullivan*, as usual, was the largest, and many improvements were effected during the year, both in the way of development and in production of larger tonnage. At present the mine production is limited by the amount the concentrator can deal with, and in the latter part of the year the production for one day ran very close to 6,000 tons. A large storage affords facilities to handle this large production in such a manner that the concentrator is able to run continuously. The work of replacing the light steel rails by heavier ones has been continued during the year and the hauling-power increased by the addition of a 30-ton locomotive of the trolley electric type.

Small changes have been made in the plant during the year with a view to greater efficiency, but substantially it remains as in the previous year. Accommodation for the employees continues to grow, and an indication of the permanent nature of this camp is reflected in the decrease of accommodation for single employees and increase of accommodation for married employees.

During our inspection of the *Sullivan* mine we have always found the conditions with respect to safety and health maintained at a very high standard, and the attitude of those in charge of the operations is such that we feel every effort is made to comply with the "Metalliferous Mines Regulation Act" and rules. Many descriptions have been written about the *Sullivan* mine, and I do not propose to attempt it, as those and that of Mr. Langley, District Mining Engineer, are all available for reference.

The *Stemwinder* mine, situated on the west side and about half a mile farther up Mark creek than the *Sullivan*, is owned by the Porcupine Goldfields Finance and Development Company, but has not been in active operation during the year.

The *Aurora* mine operated in the early part of the year, but later suspended operations, and had not resumed at the end of the year. Mr. Guindon and associates did some work on the property, also on the north side of Moyie lake, on a small scale.

The *Alice*, at Creston, was worked on a small scale, employing two men during the year.

The *Globe* mine, at Skookumchuck, operated in the early part of the year, but closed down for an indefinite period.

The *Paradise* mine, situated about 20 miles west of Invermere, was in continuous operation during the year, mostly development-work. This seemed to be sufficiently satisfactory to warrant the construction of a tramway and experimental concentrator near Jackpine, 7 miles nearer to the point of shipment, and cutting off the worst part of the haul. The conditions both

at the mine and in the living accommodation at this mine was very good and the "Metalliferous Mines Inspection Act" very well complied with. At present this property is being operated by the Victoria Syndicate, with Peter Price as local superintendent.

There was no active work at the *White Cat* mine on Slade creek during the year.

The Trites interests did a considerable amount of work on the *Giant* mine at Spillimacheen, under A. W. Davis, drilling and driving connecting drifts, but suspended work towards the end of the year.

A small amount of work was also done at the *Monarch* mine at Field, owned by Mr. Trites, but was also suspended pending the installation of a concentrator; this work was also under A. Davis's direction.

The ore mined at all the mines is silver, lead, and zinc, except the *Globe* mine, where there is in addition copper values.

## INSPECTION.

Visits to the larger mines are made frequently, in the smaller at longer intervals, the conditions existing at the mine frequently determining the number of inspections made during the year.

While we have, as already mentioned, had occasion to complain of conditions in some of the smaller mines, on the whole conditions are maintained fairly well. Many of the smaller mines, situated far from communication and difficult of access, have some reason for being unable to keep in touch with all the various points involved, but we are glad to be able to report that they are willing and anxious to comply with the rules and regulations and co-operate in the carrying-out of them.

The following table shows the number of mines inspected and the number of visits of inspection made:—

| | Mines inspected. | Visits of Inspection. |
|---|---|---|
| West Kootenay and Boundary District | 65 | 224 |
| East Kootenay | 12 | 30 |
| Totals | 77 | 254 |

## ACCIDENTS.

All serious and fatal accidents were investigated, and when an inquest was held this was attended, and we are very much indebted to the district Coroners for notice of such inquests and the privilege of examining witnesses.

As provided for by section 19 of the "Metalliferous Mines Regulation Act," notice was received of eight accidents, involving death or injury to twelve workmen. One of these accidents came under subsection (*a*); the other seven under subsection (*b*).

Two of these accidents occurred outside the mine, involving two workmen in non-fatal accidents; the other six accidents occurred underground, involving death to four workmen and serious injuries to six. This shows a slight decrease in the number of workmen injured as compared with the previous year, there being fifteen during 1926 and twelve during 1927.

In the fatal accidents there is also a decrease of one, being four during the year 1927, as compared with five during 1926.

In investigating these accidents, we find many of the smaller accidents could be avoided by a little more care on the part of the workmen.

The most serious accident occurred in the *Noble Five* mine at Sandon, when a hoisting-cable broke, allowing four workmen to drop to the bottom of the shaft, despite the fact that the cage was provided with safety-catches. Three of these were killed and the other seriously injured. The hoisting-cable, ⅝ inch in diameter, was put in service in November, 1919, and broke on April 22nd, 1927.

The other fatal accident occurred in the *Sullivan* mine, due to the falling of a barman from a ladder while endeavouring to drill a hole with a jack-hammer to bring down a piece of over-hanging side. There is always a certain amount of danger connected with this kind of work and probably more care in placing the ladder might have avoided the accident. Special ladders made of Coast fir and strengthened are now being used for the special kind of work.

Most of the other accidents could have been avoided by greater care. The only accident under subsection (*a*) was the injury to two workmen at the *Panama* mine, near Zincton, by the explosion of a shot before the workmen had completed lighting the entire round of shots. This accident seems to have been due to an error in judgment of the workmen in not properly estimating the time taken in lighting the entire round of shots or in having too short a fuse.

## WELFARE-WORK.

The only mine at which any attempt is made to carry out this work is at the *Sullivan*, where classes in first aid and other subjects are held each winter, and from where a team took part in the field-day of the East Kootenay Mine Safety Association.

The Consolidated Mining and Smelting Company, which owns the *Sullivan* mine, has also provided very fine recreation-halls for the indoor amusement of their workmen, as well as facilities for grounds for baseball, football, tennis, and golf during the summer and skating, hockey, and curling during the winter.

In the matter of consideration for its workmen, either in safety, health, or recreation, this company sets an example which is very hard to surpass, and explains to a great extent the cordial relations which exist between it and its employees, as well as freedom from industrial disturbances.

We again wish to thank the workmen and officials for their assistance and co-operation in carrying out the duties of inspection during the year and look forward with confidence to a continuation of the same during the year 1928.

# REPORTS OF COAL-MINE INSPECTORS.

The coal-mines of the Province are situated in four Inspection Districts—namely, Vancouver Island, Northern, Nicola-Princeton, and East Kootenay Districts.

## VANCOUVER ISLAND INSPECTION DISTRICT.

THOS. R. JACKSON, JAS. STRANG, AND JAS. W. JEMSON, INSPECTORS.

The Canadian Collieries (Dunsmuir), Limited, operated Nos. 4, 5, and 6 mines, Comox Colliery, and Nos. 1, 2, 3, 5, 6, 8, and 9 mines, and Vancouver slope, Wellington Extension Colliery.

The Western Fuel Corporation of Canada, Limited, operated No. 1, Reserve, and Wakesiah mines, Nanaimo Colliery.

The Granby Consolidated Mining, Smelting, and Power Company, Limited, operated No. 1 mine, Granby Colliery, Cassidy.

The East Wellington Coal Company, Limited, operated No. 1 mine, East Wellington.

King & Foster (Island Collieries) operated Nos. 2 and 6 mines at Wellington.

The West Coast Collieries, Limited (Morden and Suquash Collieries), did not operate during the year.

Diamond Jubilee operated its No. 1 mine at Nanaimo.

Fiddick mine was operated at South Wellington.

## NORTHERN INSPECTION DISTRICT.

THOS. J. SHENTON, INSPECTOR.

The Telkwa Collieries, Limited, operated the Goat Creek mine.

## NICOLA-PRINCETON INSPECTION DISTRICT.

JOHN G. BIGGS, INSPECTOR (HEADQUARTERS, MERRITT).

The Middlesboro Collieries, Limited, operated Nos. 1, 2, and North, No. 5 South, Nos. 2, 4, 4 East, and 5 East mines, Middlesboro Colliery, Merritt.

The Coalmont Collieries, Limited, operated Nos. 3 and 4 mines, Coalmont Colliery, Blakeburn.

The Tulameen Valley Coal Mine Company operated its No. 1 mine.

Southern Okanagan Collieries, Limited, operated Nos. 3 and 5 seams.

Lynden Coal Company, Limited, operated its No. 1 mine.

## EAST KOOTENAY INSPECTION DISTRICT.

ROBT. STRACHAN, SENIOR INSPECTOR, AND JOHN MACDONALD AND H. E. MIARD, INSPECTORS (HEADQUARTERS, FERNIE).

The Crow's Nest Pass Coal Company, Limited, operated No. 1 East, No. 2, No. 3, No. 1 South, and No. 9 mines, Coal Creek Colliery, and No. 3, No. 3 East, and No. 8 mines, Michel Colliery.

The Corbin Coals, Limited, operated Nos. 4 and 6 mines, Corbin Colliery.

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## VANCOUVER ISLAND INSPECTION DISTRICT.

REPORTS BY THOS. R. JACKSON AND JAMES W. JEMSON, INSPECTORS.

### Western Fuel Corporation of Canada, Ltd.

Head Office—Nanaimo, B.C.

H. J. McClung, President, Phoenix, Arizona; G. W. Bowen, Vice-President and Managing Director, Nanaimo, B.C.; Mark Bate, Secretary-Treasurer, Nanaimo, B.C.; John Hunt, General Manager, Nanaimo, B.C.

The above company operated during 1927 the Nanaimo Colliery, which consists of No. 1, Reserve, and Wakesiah mines, all situated in the vicinity of the city of Nanaimo.

AGGREGATE RETURNS FROM THE WESTERN FUEL CORPORATION'S MINES FOR YEAR 1927.

| SALES AND OUTPUT FOR YEAR. | COAL. | | COKE. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 398,815 | ..... | ..... | ..... |
| Sold for export to United States | 54,139 | ..... | ..... | ..... |
| Sold for export to other countries | ..... | ..... | ..... | ..... |
| Total sales | ..... | 452,954 | ..... | ..... |
| Used in making coke | ..... | ..... | ..... | ..... |
| Lost in washing | 38,712 | ..... | ..... | ..... |
| Used under colliery boilers, etc | 74,981 | ..... | ..... | ..... |
| Total for colliery use | ..... | 113,693 | ..... | ..... |
| | | 566,647 | | |
| Stocks on hand first of year | 25,405 | ..... | ..... | ..... |
| Stocks on hand last of year | 29,736 | ..... | ..... | ..... |
| Difference added to stock during year | ..... | 4,331 | ..... | ..... |
| Output of colliery for year | | 570,978 | ..... | ..... |

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

| Character of Labour. | UNDERGROUND. | | ABOVE GROUND. | | TOTALS. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| Supervision and clerical assistance | 45 | ..... | 42 | ..... | 87 | ..... |
| Whites— | | | | | | |
| Miners | 335 | ..... | ..... | ..... | 335 | ..... |
| Miners' helpers | 6 | ..... | ..... | ..... | 6 | ..... |
| Labourers | 289 | ..... | 110 | ..... | 399 | ..... |
| Mechanics and skilled labour | 118 | ..... | 99 | ..... | 217 | ..... |
| Boys | 47 | ..... | 36 | ..... | 83 | ..... |
| Japanese | ..... | ..... | ..... | ..... | ..... | ..... |
| Chinese | ..... | ..... | 110 | ..... | 110 | ..... |
| Indians | 2 | ..... | 1 | ..... | 3 | ..... |
| Totals | 842 | ..... | 398 | ..... | 1,240 | ..... |

REPORT BY THOS. R. JACKSON AND JAS. W. JEMSON, INSPECTORS.

## NANAIMO COLLIERY.

### No. 1 MINE.

Arthur Newbury, Manager; A. W. Courtney, Overman, North Side No. 1 Mine; John Sutherland, Overman, South Side No. 1 Mine; Jas. Dudley, T. J. Wood, Thos. Smith, Geo. Perry, Geo. Jardine, William Cass, Jas. McMeakin, Andrew Bennett, David Stobbart, F. Cope, Fred Nash, G. Frater, Jos. Norris, Jos. Dean, Geo. Moore, Jos. Nichol, N. McMillan, John Weeks, Geo. B. Bradshaw, Wm. Frew, Alex. Rowan, Alex. Coombe, Wm. Neave, Fred Menzies, Matt Broderick, and John Marrs, Firebosses.

This mine is situated at the south end of the Esplanade on the shore-line of the bay. It is the oldest working-mine in the Nanaimo district and has a large submarine area extending several miles in a seaward direction. The mine has four openings. No. 1 shaft is used for hoisting coal and the screening plant is situated at this shaft; it also serves as a downcast shaft for the ventilation of the South side workings. The men working in the South side portion of

the mine are also raised and lowered at this shaft. No. 2 shaft, which is situated about 300 feet distant from No. 1, serves as an upcast shaft for the ventilation of the South side workings.

Protection shaft is situated across the bay, on Protection island, about a mile from No. 1 shaft, and serves as a downcast for the North side workings, also as a hoisting-shaft for the workmen employed on this side of the mine, who are transported by ferry across the bay. The shaft is 630 feet deep, fitted with two cages. The hoist is similar to No. 1 hoist and operated by steam. The ventilating-fan at Protection is a Sirocco, rope-driven, having a capacity of 80,000 cubic feet a minute, against a water-gauge of 1½ inches. A reserve fan of the Guibal type is in readiness at all times.

Part of the return air passes by way of No. 2 shaft, near No. 1, the remainder going to Newcastle shaft, on Newcastle island, about 3 miles from No. 1 shaft. This is provided with a ladder-way for inspection purposes and also affords a means of ingress and egress for No. 1 mine.

The power plant for the North side is situated on Protection island, and consists of four return-tubular boilers, having a combined rating of 550 horse-power; two compressors, cross-compound Canadian Rand, with a capacity of 2,500 cubic feet of free air a minute each.

The power plant of No. 1 mine consists of two 530-horse-power Babcock & Wilcox water-tube boilers, coupled with two 208-horse-power return-tubular boilers which operate at a lower pressure than the Babcock & Wilcox; the steam from the Babcock & Wilcox passing through a No. 8 Locke pressure-reducing regulator which works very satisfactorily. The Babcock & Wilcox boilers were installed during 1925, being completed in October, and are equipped with chain-grate stokers, induced and forced draught fans. Cope's feed-water regulators and Cochtane's steam-flow meter.

The installation of the two new boilers dispensed with the service of two water-tube boilers and six return-tubular boilers, four of the latter being left for purposes of emergency. The present installation marks a considerable saving of both fuel and man-power.

The boilers supply steam to the power plant, which consists of two cross-compound Ingersoll-Rand compressors, each supplying 2,500 cubic feet of air a minute, and two Robb-Armstrong Corliss-valve engines which are direct-connected to d.c. generators, also to fan, hoisting, and washery engines and mine-pump. The hoisting-engines at No. 1 and Protection shafts are steam-driven.

Electrical equipment consists of two generators driven by steam-engines. One generator is of the Westinghouse type, 250 kw., running at 150 r.p.m. and direct-coupled to a Robb-Armstrong steam-engine. These units supply power to all the electrically driven machinery above ground and underground. There are, underground, one 10-ton Westinghouse motor; three 6-ton Jeffrey motors; and one 10-ton Edison motor, all of which are operated on the open overhead-trolley system; four electric hoists ranging from 30 to 140 horse-power; and a 3-stage centrifugal pump driven by a 125-horse-power motor running at 1,740 r.p.m.

The power is carried into the mine by four armoured cables which enter the mine by way of the shaft; two of these are leads and two returns.

In connection with the washery plant, two centrifugal pumps of the Fairbanks-Morse type and capable of delivering 1,000 gallons of water a minute each are driven by two 40-horse-power motors. There is also a 90-horse-power motor for the sludge-pump and a 30-horse-power motor used for driving the coal-washers. Seven motors are in use at the coal wharves for raising and lowering the coal-chutes to facilitate loading scows or ships. Firebosses and shotlighters use the Wolf flame safety-lamp and workmen use the Edison electric safety-lamp. Operations are being conducted in the Douglas and Newcastle seams. On the South side of the mine the Douglas seam is wrought exclusively; on the North side of the mine coal is taken from both seams. Only permitted explosives are used for blasting; shots are fired by cable and electric battery; compressed air and electricity are used as motive power for haulage and drainage purposes. Hoisting-engines at the shafts are steam-driven.

Haulage on the Main levels on the North side of the mine is done by electric locomotives of the overhead-trolley type. Heavy steel rails are laid and a copper trolley-wire carried for approximately 3 miles on No. 1 level, extending from the shaft to a point beyond the foot of Lamb's incline. Haulage on the South side of the mine is a combination of electric motor and direct rope-haulage on the main roads and drivers and horses are employed for the purpose of getting the cars to and from the working-faces to the main haulage.

During the inspections made in December the following conditions were found to prevail:—

*Diagonal Slope Split.*—Ventilation fairly good; roadways and timbering good. No explosive gas was found in this district. There was 12,750 cubic feet of air a minute passing for the use of thirty men and six horses.

The No. 3 Motor-road split had 9,500 cubic feet of air a minute passing for the use of twenty-five men and four horses. Ventilation, roads, and timbering good; repairs to roadways being carried out where required. This district was practically free from coal-dust owing to water and natural heavy dampness. No. 5 North split had 9,544 cubic feet of air a minute passing for the use of fifty men and six horses. The ventilation was fairly good; roadways and timbering good generally, and the sections were fairly free from coal-dust.

Small quantities of explosive gas were found in two places and a small gas-cap in a third.

On the North side of the mine most of the workings are submarine areas, having an average cover of about 450 feet. Two seams are operated—namely, the Douglas and the Newcastle or Lower seam. The only development-work done on the North side was a rock tunnel driven from No. 3 wall in the Lower seam to the Douglas. The tunnel is about 200 feet long; the gradient 1 in 4, operated by gravity. A large area of pillar and solid work is expected to be recovered in this section, which is known as No. 10 South; the seam varies considerably in thickness and is mixed with bands of rock, varying in thickness and hardness. At present this section is partly machine-mined by the Siskol machine on a small long-wall face.

Working conditions have generally been found to be satisfactory, no gas, and well ventilated. There was 7,000 cubic feet a minute passing into section for the use of eleven men and one horse.

The following conditions were found to prevail at the time of inspection during the month of December, 1927:—

*No. 2 Incline (Douglas Seam).*—Pillar-extraction. Only 6,500 cubic feet of air passing for eleven men and three horses. Free from gas, well timbered, and in general good order. The gobs fairly well filled by cogs and refuse. This section is finishing fairly rapidly.

*No. 5 Wall (Newcastle Seam).*—This section is practically all machine-mined; the coal is very irregular and faulted, and therefore there are several small sections. The roof is very good and generally well timbered. There are forty-three men employed here.

*No. 6 Wall (Newcastle Seam).*—This section is reached by a rock tunnel about 175 feet long, grade 1 in 3. The seam here is only 24 inches thick, but of superior quality, undermined by the latest type Mavor & Coulson chain-cutting machine, "The Samson," which is proving very satisfactory in every respect. The coal is loaded by shaker conveyors from the two faces, which are about 300 feet long, thus a great deal of brushing is avoided. The gob is filled by cogging and machine cuttings of rock and soon becomes a solid mass. The roof, being sandstone, is ideal for an extensive face-line. Only by the application of the most up-to-date mining machinery could such a thin seam be made profitable.

*No. 7 Wall (Douglas Seam).*—This is the extreme end of the workings on the North side of No. 1 mine and is mined on the long-wall system, partly undermined by mining-machines, but recently a number of small pneumatic hand-picks have been introduced to take the place of hand-mining, as the mining was sometimes too hard for hand-work. The "Woodpecker," the name given to the pneumatic pick by the miners, is appreciated by them, as they save a lot of hard work and enable them to produce more and better coal. The seam here has several bands of dirt, making the product hard to clean. The roof is of inferior coal, which is propped up, but requires careful attention and timbering on behalf of the workmen and mine officials. Notwithstanding this inferior roof condition, only one serious accident has occurred in this section, when on February 19th, 1927, a man employed as a brusher was fatally injured by a fall of roof after a shot had been fired in the brushing. No gas has been reported and working conditions are generally good.

The workmen availed themselves of the opportunity provided by the provisions of section 101, Rule 37, of examining the mine. Inspections have been made regularly during the year and reports of inspections, which were generally satisfactory, have been sent to this office.

There were two fatal accidents in this mine during the year.

The following are the official returns for No. 1 mine for the year ended December 31st, 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 241,767 | | | |
| Sold for export to United States | 32,820 | | | |
| Sold for export to other countries | | | | |
| Total sales | | 274,587 | | |
| Used in making coke | | | | |
| Lost in washing | 19,792 | | | |
| Used under colliery boilers, etc | 49,594 | | | |
| Total for colliery use | | 69,386 | | |
| | | 343,973 | | |
| Stocks on hand first of year | 15,024 | | | |
| Stocks on hand last of year | 18,334 | | | |
| Difference added to stock during year | | 3,310 | | |
| Output of colliery for year | | 347,283 | | |

Average Number of Hands employed, Daily Wages paid, etc.

| Character of Labour. | Underground. | | Above Ground. | | Totals. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| | | $ | | $ | | |
| Supervision and clerical assistance | 28 | | 23 | | 51 | |
| Whites— | | | | | | |
| Miners | 171 | 7.20 | | | 171 | |
| Miners' helpers | | | | | | |
| Labourers | 199 | 4.01–4.55 | 64 | 3.12–4.68 | 263 | |
| Mechanics and skilled labour | 90 | 4.55–6.50 | 54 | 4.92–5.92 | 144 | |
| Boys | 26 | 1.78–3.54 | 19 | 1.14–3.00 | 45 | |
| Japanese | | | | | | |
| Chinese | | | 56 | 2.20–3.20 | 56 | |
| Indians | 1 | 4.30 | 1 | | 2 | |
| Totals | 515 | | 217 | | 732 | |

Report by Thos. R. Jackson, Inspector.

## RESERVE MINE.

Robert Laird, Manager; Clifford Dickinson, Overman; Ernest Kelly, Jacob Stobbart, Fred Bell, Harry Allsopp, Harry Meikle, and William Neilson, Firebosses.

This mine is situated in the Cranberry district, about 5 miles south of Nanaimo. The first shaft sunk reached the seam at a depth of 1,162 feet. On account of folding in the measures and heavy pitching it was decided to drive a crosscut tunnel 7 by 12 in section across the measures at a point 950 feet from the surface, with the result the seam was struck at a distance of 180 feet from the shaft.

The second shaft was sunk to a depth of 950 feet and a tunnel driven across the measures for a similar distance and the seam struck. A level was then driven in the coal a distance of 300 feet, connecting the two tunnels. After considerable development-work had been done from this point a new tunnel was driven across the measures from No. 1 shaft at a point 200 feet higher, penetrating the seam at a point about 200 feet distant from the shaft. This tunnel is now the main haulage of the mine.

Operations are conducted in the Douglas seam, which is very much troubled with folds or overlaps, which tend to make operations difficult. At times the seam pinches out and may be found underlapping or overlapping. The coal, which varies from 3 to 20 feet in thickness, is fairly hard, with a fairly good roof.

The men affected by sulphur in the mine were even less than last year. The place affecting the workmen most at present is in the new solid workings of No. 8 slope; other sections of the mine are so slight as to be scarcely noticed.

The ventilation of the mine is produced by a pair of 90-inch Sirocco fans, connected to a 20- by 30-inch engine, rope-driven. On the engine is a drive-wheel 5 feet in diameter. These fans, running at an engine-speed of 16 r.p.m., are capable of producing 100,000 cubic feet of air a minute, against a 3-inch water-gauge.

A description of the surface plant at this mine has been given in former reports. The underground mechanical haulage is carried on by means of compressed-air winches.

Edison electric head-lights are used exclusively by all the workmen; the firebosses and shot-lighters use the Wolf-type flame safety-lamp.

The management completed successfully underground diamond-drilling operations for the purpose of draining old No. 5 mine-workings, which were separated from the present workings in Reserve mine by a 300-foot barrier-pillar. The distance from where the drill was set up to the old working-line was calculated to be approximately 200 feet and the elevation to be attained by the drill was in the neighbourhood of 60 feet. Three holes were drilled. The first two failed to strike water, but from their distance and angle the management deduced the proper angle to drill the third hole, which at a distance of 225 feet tapped the water, the pressure of which registered on the gauge 145 lb. to the square inch. Dewatering this mine will enable the operators to reach quite an area of old workings where it is considered there are some good pillars of high-grade coal to be found. The coal obtained from this old area will be handled by the Reserve operations.

Three visits of inspection were made to this mine during December, and the general conditions were good respecting roadways and timbering and the state of the ventilation varied from fair to good in the different districts of the mine.

Small quantities of explosive gas were found in two places in No. 8 slope.

The mine is inclined to draw water on the roadways and a general dampness prevails throughout the mine, which to a large extent militates against the necessity of resorting to the usual devices for rock-dusting or watering. Where necessary the material on the roadways is loaded out and flue-dust employed as the inert means of combating the coal-dust trouble to be in accordance with the requirements of the "Coal-mines Regulation Act."

The analysis of the coal-dust samples submitted to this office were (in nearly all cases) in keeping with the rules and regulations of the above Act.

The following data *re* ventilation were taken during my December visits:—

I measured 37,500 cubic feet of air a minute passing in the main return airway near No. 8 level.

*No. 8 Section Split.*—There was 4,000 cubic feet of air a minute passing for the use of twenty men and four horses.

*Tunnel Split.*—There was 5,000 cubic feet of air a minute passing for the use of twenty men and four horses.

*No. 9 North Level Split.*—There was 6,000 cubic feet of air a minute passing for the use of twenty-two men and three horses.

*No. 10 Dip Split.*—There was 7,500 cubic feet of air a minute passing for the use of twenty-eight men and four horses.

The workmen of this mine availed themselves of the opportunity provided by the provisions of section 101, Rule 37, of the "Coal-mines Regulation Act."

There were no fatal accidents at this mine during the year.

The following are the official returns for Reserve mine for the year ended December 31st, 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 129,232 | ..... | ..... | ..... |
| Sold for export to United States | 17,543 | ..... | ..... | ..... |
| Sold for export to other countries | ..... | ..... | ..... | ..... |
| Total sales | ..... | 146,775 | ..... | ..... |
| Used in making coke | ..... | ..... | ..... | ..... |
| Lost in washing | 16,831 | ..... | ..... | ..... |
| Used under colliery boilers, etc | 11,197 | ..... | ..... | ..... |
| Total for colliery use | ..... | 28,028 | ..... | ..... |
| | | 174,803 | | |
| Stocks on hand first of year | 6,642 | ..... | ..... | ..... |
| Stocks on hand last of year | 8,415 | ..... | ..... | ..... |
| Difference added to stock during year | ..... | 1,773 | ..... | ..... |
| Output of colliery for year | ..... | 176,576 | ..... | ..... |

Average Number of Hands employed, Daily Wages paid, etc.

| Character of Labour. | Underground. | | Above Ground. | | Totals. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| | | $ | | $ | | |
| Supervision and clerical assistance | 10 | ..... | 12 | ..... | 22 | ..... |
| Whites— | | | | | | |
| Miners | 106 | 6.67 | ..... | ..... | 106 | ..... |
| Miners' helpers | 4 | 4.01 | ..... | ..... | 4 | ..... |
| Labourers | 64 | 4.01–4.55 | 33 | 3.50–4.68 | 97 | ..... |
| Mechanics and skilled labour | 20 | 4.55–6.40 | 32 | 4.92–5.56 | 52 | ..... |
| Boys | 14 | 1.78–3.54 | 11 | 1.14–3.00 | 25 | ..... |
| Japanese | ..... | ..... | ..... | ..... | ..... | ..... |
| Chinese | ..... | ..... | 42 | 2.20–3.08 | 42 | ..... |
| Indians | 1 | 4.30 | ..... | ..... | 1 | ..... |
| Totals | 219 | ..... | 130 | ..... | 349 | ..... |

Report by Jas. W. Jemson, Inspector.

## WAKESIAH COLLIERY.

W. H. Moore, Manager; Nat Bevis, Overman; Thomas Chapman, H. Carroll, Andrew Dean, A. Derbyshire, and Robert Reid, Firebosses.

This mine is situated on the Western Fuel Corporation of Canada's farm, about 2 miles from Nanaimo, and is operated in the Wellington seam, which here varies from 2 to 20 feet in thickness. Minor dislocations are common and the dip, although irregular, is moderate, except on the western side of the mine, where it varies from 20° to 65°. Mining is by the pillar-and-stall method. Owing to shortage of trade the mine was closed down in April, 1927, only a few maintenance-men remaining at work, carrying out improvements to the haulage system. A new rock tunnel was started to provide a new haulage-road for the Chute district, which when completed will simplify the existing haulage and ventilation arrangements. This will be completed early in the next year. The coal trade having improved, the mine was opened again in October, 1927.

Western Fuel Corporation of Canada, Ltd.—No. 1, Nanaimo.

Demonstration Mine at Nanaimo.

Corbin Colliery—Stripping No. 5.

Lynden Coal Co., Princeton.

The mine is entered by two shafts, 320 feet in depth. The coal is hoisted by a 14 by 16 first-motion steam-hoist, a single cage with counterbalance being used. With the exception of the shaft-bottom pump, which is operated by steam, compressed air is used exclusively for motive power for the four winches and four pumps underground. Both shaft-bottom and stable are electrically lighted. The roof is a sandy shale, often frail and demanding careful timbering. The roadways are generally damp. Storage-battery electric cap-lamps are used exclusively, with Wolf safety-lamps for gas-testing purposes.

The mine is ventilated by a 90-inch Sirocco fan, rope-driven. A considerable amount of development-work has been done in the new Chute district, while pillars are being extracted in the Lewis district. At present all the output is being won by hand-mining.

A fatality occurred on January 13th, 1927, when John Webber, fireboss, was caught by a small cave and suffocated. A serious accident befell Robert Dean, coal-miner, on December 17th by a fall of rock at the working-face.

The following are the official returns for the Wakesiah mine for the year ended December 31st, 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 27,816 | ..... | ..... | ..... |
| Sold for export to United States | 3,776 | ..... | ..... | ..... |
| Sold for export to other countries | ..... | ..... | ..... | ..... |
| Total sales | ..... | 31,592 | ..... | ..... |
| Used in making coke | ..... | ..... | ..... | ..... |
| Lost in washing | 2,089 | ..... | ..... | ..... |
| Used under colliery boilers, etc | 14,190 | ..... | ..... | ..... |
| Total for colliery use | ..... | 16,279 | ..... | ..... |
| | | 47,871 | | |
| Stocks on hand first of year | 3,739 | ..... | ..... | ..... |
| Stocks on hand last of year | 2,987 | ..... | ..... | ..... |
| Difference taken from stock during year | ..... | 752 | ..... | ..... |
| Output of colliery for year | ..... | 47,119 | ..... | ..... |

Number of Hands employed, Daily Wages paid, etc.

(Average for seven months operated.)

| Character of Labour. | Underground. | | Above Ground. | | Totals. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| | | $ | | $ | | |
| Supervision and clerical assistance | 7 | ..... | 7 | ..... | 14 | ..... |
| Whites— | | | | | | |
| Miners | 58 | 6.91 | ..... | ..... | 58 | ..... |
| Miners' helpers | 2 | 4.01 | ..... | ..... | 2 | ..... |
| Labourers | 26 | 4.01–4.55 | 13 | 3.50–4.68 | 39 | ..... |
| Mechanics and skilled labour | 8 | 4.55–5.50 | 13 | 4.92–5.56 | 21 | ..... |
| Boys | 7 | 1.78–3.54 | 6 | 1.14–3.00 | 13 | ..... |
| Japanese | ..... | ..... | ..... | ..... | ..... | ..... |
| Chinese | ..... | ..... | 12 | 2.20–3.08 | 12 | ..... |
| Indians | ..... | ..... | ..... | ..... | ..... | ..... |
| Totals | 108 | ..... | 51 | ..... | 159 | ..... |

## Canadian Collieries (Dunsmuir), Ltd.

Head Office—Montreal, Que.

F. Perry, President, Montreal, Que.; Lieut.-Col. Chas. W. Villiers, General Manager, Victoria, B.C.; H. S. Adlington, Secretary, Montreal, Que.; P. S. Fagan, Assistant Secretary, Victoria, B.C.; Thomas Graham, General Superintendent, Cumberland, B.C.

The above company operated the following mines during 1927: The Comox Colliery, Nos. 4, 5, and 6 mines, situated in the vicinity of Cumberland; the Wellington Extension Colliery, Nos. 1, 2, 3, 5, 6, 8, and Vancouver slope, situated at Extension; No. 5 mine, situated at South Wellington; and No. 9 mine, situated at Wellington. (No. 9 mine was formerly operated by King & Foster Coal Company, Nanaimo.)

The following returns show the combined output of the company's collieries during 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 369,188 | ..... | ..... | ..... |
| Sold for export to United States | 43,290 | ..... | ..... | ..... |
| Sold for export to other countries | ..... | ..... | ..... | ..... |
| Total sales | ..... | 412,478 | ..... | ..... |
| Used in making coke | ..... | ..... | ..... | ..... |
| Lost in washing | 71,660 | ..... | ..... | ..... |
| Used under colliery boilers, etc | 25,718 | ..... | ..... | ..... |
| Total for colliery use | ..... | 97,378 | ..... | ..... |
| | | 509,856 | | |
| Stocks on hand first of year | 9,171 | ..... | ..... | ..... |
| Stocks on hand last of year | 20,451 | ..... | ..... | ..... |
| Difference added to stock during year | ..... | 11,280 | ..... | ..... |
| Output of colliery for year | ..... | 521,136 | ..... | ..... |

Number of Hands employed, Daily Wages paid, etc.

| Character of Labour. | Underground. | | Above Ground. | | Totals. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| Supervision and clerical assistance | 52 | ..... | 29 | ..... | 81 | ..... |
| Whites— | | | | | | |
| Miners | 510 | ..... | ..... | ..... | 510 | ..... |
| Miners' helpers | 15 | ..... | ..... | ..... | 15 | ..... |
| Labourers | 172 | ..... | 114 | ..... | 286 | ..... |
| Mechanics and skilled labour | 89 | ..... | 130 | ..... | 219 | ..... |
| Boys | 7 | ..... | 35 | ..... | 42 | ..... |
| Japanese | 55 | ..... | ..... | ..... | 55 | ..... |
| Chinese | 176 | ..... | 90 | ..... | 266 | ..... |
| Indians | ..... | ..... | ..... | ..... | ..... | ..... |
| Totals | 1076 | ..... | 398 | ..... | 1,474 | ..... |

## COMOX COLLIERIES.

Report by Thos. R. Jackson, Inspector.

These mines are situated in the Comox district, 13 miles from Union Bay (by road). A railway 20 miles in length, over which the output is conveyed, connects the separate mines to a shipping-point at Union Bay.

The mines worked are Nos. 4, 5, and 6. The latter is a shaft acting as a means of drainage and intake air for No. 5 mine. No. 4 mine is located at the east end of Comox lake, about 3 miles from Cumberland. No. 5 mine is about a mile away from the city. No. 6 is close to the city.

The mine ventilation of Nos. 1 and 2 slopes, of which No. 4 mine is comprised, is produced by a Sullivan reversible fan, double-inlet, having a capacity of 180,000 cubic feet of air a minute, against a 6-inch water-gauge. This fan, which is located at the return end of No. 2 parallel slope, is electrically driven by a 250-horse-power induction-motor, 2,200 volts, speed 250 r.p.m., directly connected to the fan-shaft. A 108-inch double-inlet reversible Sirocco fan is situated at the return end of No. 1 parallel slope and is in operation.

The hydro-electric plant of this company, which has been described in previous reports, has been in constant operation during 1927. Sufficient electricity is generated at this plant to supply motive power to all the collieries, the wharf at Union Bay, and for the lighting of Courtenay, Union Bay, and Cumberland.

### No. 4 Mine.

Thos. Williams, Manager; John S. Williams, Overman, No. 1 Slope; Chas. Parnham, Overman, No. 2 Slope; Charles O'Brien, Sam Horwood, William Devoy, Harry Jackson, A. W. Watson, Tom Shields, William Herd, Thomas Lewis, J. H. Vaughan, Robert Walker, Watkin Williams, Alf Jones, James Quinn, and E. H. Devlin, Firebosses.

This mine consists of two slopes with but one main entrance. There is also a manway part of the way. No. 1 slope runs due north; the lower workings below No. 14 West level are practically abandoned. No. 2 slope runs N. 45° E. and all work is practically finished for a hundred yards or so above No. 15 East level and filled with water. These slopes diverge at a point about 75 feet from the main portal. The electric haulage-engine is so connected that trips can be run simultaneously on both slopes to a point where they converge to the main entrance.

The men are conveyed from the bottom and other sections of the slope in a man-trip at the end of each working-shift. A safety-car is connected to the rear end of the man-trip, which ensures the safety of the workmen while riding up the slope. As a precaution against trips breaking away on these slopes the car is now used behind all trips ascending the slopes.

Electric head-lights of the Edison storage-battery type are used by the workmen and the firebosses use the flame safety-lamps of the Wolf type for testing purposes.

In No. 1 slope electricity is used as the motive power to operate all pumps, winches, and motors. A storage-battery locomotive is employed for haulage purposes in No. 11 West level.

The extraction of pillars is general throughout the mine. The thickness of the seam varies from 3 to 7 feet.

The following conditions were found to prevail during the inspection in December:—

The quantity of air entering the main portals of the mine was made up as follows: Main tunnel quantity equals 112,320 cubic feet of air a minute and manway quantity equals 35,400 cubic feet of air a minute passing, making a total quantity of 147,720 cubic feet.

The present workings are confined to Nos. 7, 9, 11, 12, and 14 West levels, also the slope-bottom. The general conditions of the mine varied from fairly good to good. The roadways and timbering were in a good state, except where repairs were being made.

No explosive gas was found. A slight mixture of black-damp was found in the air at the face of No. 1 incline.

There was 36,400 cubic feet of air a minute passing into No. 11 West level, which divides into two splits (right and left). The Right side split had 14,000 cubic feet of air a minute passing for the use of fifty-two men and six mules. The Left side split had 16,000 cubic feet of air a minute passing for the use of sixty-five men and seven mules.

A heavy natural dampness, with a fair amount of water, prevails throughout the various sections of the slope, causing the mine as a whole to be fairly free from coal-dust.

In No. 2 slope, No. 4 Comox mine, the pillars are now extracted above No. 15 West level, which left considerable space in the old waste workings for water to accumulate in. Owing to this condition the electric pump was withdrawn and will be installed farther up the slope to connect with a new wood pipe-line discharge which leads to the surface, also up the Main slope.

Formerly the discharge-pipes from the electric pump were connected to a borehole up which the water was forced to the surface. This pump will handle all the water that is required to be pumped from No. 4 Comox mine.

The damp and watery conditions of this slope are similar to No. 1 slope, so that it is fairly free from coal-dust.

The analysis of mine-dust samples taken from each slope show, with the exception of a few cases (samples taken each month), that they comply with the provisions of the "Coal-mines Regulation Act."

During my visit of inspection in December I found the general condition of the mine to be fairly good. I found no explosive gas. The timbering and spragging was in good order. The ventilation was good generally, with the exception of No. 5 East Level district, which was fair. The management is advancing a system of ventilation which will in a short time improve the present conditions of the ventilation in this section of the mine.

I measured 63,000 cubic feet of air a minute passing down the Main slope at a point immediately above No. 5 East level, and on the Main slope near No. 10 West level the quantity of air passing was 24,000 cubic feet of air a minute.

The West side split had 14,000 cubic feet of air a minute passing for the use of thirty-five men and four mules. The East split had 16,000 cubic feet of air a minute passing for the use of forty-six men and seven mules.

No. 4 Comox mine continues to liberate very little methane; perhaps this condition may be attributed to the fact that there is no solid work development taking place. The probable reason for the small amount of $CH_4$ being in the pillar-work to-day is on account of the occluded gas having drained off during or immediately following the first working of the coalfield.

Mine-air samples taken in the various main return airways show a methane content of from 0.1 to 0.2 per cent. These samples were taken at various intervals during the year and forwarded to the Dominion Department of Mines, Ottawa, for analysis.

I regret to state that a Japanese miner was fatally injured in No. 1 slope, No. 4 Comox mine.

There were three occurrences during the year of which special notice was forwarded by the management as per section 71, "Coal-mines Regulation Act"—namely, two underground gob-fires and a short circuit in the electrical installation. The above occurrences were dealt with at once; the fires being sealed off without injury to any one.

Advantage was taken by the workmen, under provision of Rule 37 of section 101 of the "Coal-mines Regulation Act," to appoint their own representatives for the purpose of examining the mine. Inspections have been made regularly and the reports furnished at this office have shown conditions found were generally satisfactory.

### No. 5 Mine.

This mine has been inactive in coal production since about the middle of April. It is still kept open for mine-inspection purposes and also for the purpose of operating the pumps in connection with mine drainage.

One fireboss and another man attend to whatever duties there are to perform. For further description of mine, plant, etc., *see* 1926 Report of Minister of Mines. I inspected this mine in December and found the general conditions, including the ventilation, to be good. There was 112,000 cubic feet of air a minute passing in main East level.

### No. 6 Mine.

This mine is supervised by those at present engaged in No. 5 mine. Practically all the water entering Nos. 5 and 6 mines is hoisted from No. 6 shaft by specially constructed tanks capable of delivering 1,200 gallons of water a minute.

During December visit of inspection I measured 60,000 cubic feet of air a minute passing towards the shaft from the main roadway. In severe winter weather the fan at No. 5 mine is reversed, causing both Nos. 5 and 6 shafts to be upcast instead of downcast shafts. The warm air ascending the shafts reduces the tendency of ice forming there during low-temperature conditions.

The roadways and timbering in No. 6 mine were in fair condition and the stoppings good. Some black-damp was found escaping from the blow-hole in No. 1 left stopping.

The following are the official returns for the year ended December 31st, 1927, and the aggregate output of all the mines of the Comox Colliery:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 196,251 | ..... | ..... | ..... |
| Sold for export to United States | 2,214 | ..... | ..... | ..... |
| Sold for export to other countries | ..... | ..... | ..... | ..... |
| Total sales | ..... | 198,465 | ..... | ..... |
| Used in making coke | ..... | ..... | ..... | ..... |
| Lost in washing | 24,451 | ..... | ..... | ..... |
| Used under colliery boilers, etc | 4,579 | ..... | ..... | ..... |
| Total for colliery use | ..... | 29,030 | ..... | ..... |
| | | 227,495 | ..... | ..... |
| Stocks on hand first of year | 2,560 | ..... | ..... | ..... |
| Stocks on hand last of year | 8,959 | ..... | ..... | ..... |
| Difference added to stock during year | ..... | 6,399 | ..... | ..... |
| Output of colliery for year | ..... | 233,894 | ..... | ..... |

Number of Hands employed, Daily Wages paid, etc.

| Character of Labour. | Underground. | | Above Ground. | | Totals. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| Supervision and clerical assistance | 23 | ..... | 14 | ..... | ..... | ..... |
| Whites— | | | | | | |
| Miners | 88 | ..... | ..... | ..... | ..... | ..... |
| Miners' helpers | ..... | ..... | ..... | ..... | ..... | ..... |
| Labourers | 32 | ..... | 40 | ..... | ..... | ..... |
| Mechanics and skilled labour | 65 | ..... | 53 | ..... | ..... | ..... |
| Boys | 7 | ..... | 9 | ..... | ..... | ..... |
| Japanese— | | | | | | |
| Miners | 32 | ..... | ..... | ..... | ..... | ..... |
| Miners' helpers | 23 | ..... | ..... | ..... | ..... | ..... |
| Chinese— | | | | | | |
| Miners | 65 | ..... | ..... | ..... | ..... | ..... |
| Miners' helpers | 52 | ..... | 20 | ..... | ..... | ..... |
| Labourers | 53 | ..... | ..... | ..... | ..... | ..... |
| Totals | 440 | ..... | 136 | ..... | 576 | ..... |

Report by J. W. Jemson, Inspector.

## WELLINGTON EXTENSION MINES.

Thomas A. Spruston, District Superintendent.

This division of the Canadian Collieries mining properties comprises Nos. 1, 2, 8, and New Vancouver slope, No. 5 South Wellington, and No. 9 North Wellington; the latter two each form a separate section of this report. The entire output of the Extension Collieries is brought to Ladysmith over the Wellington Collieries Railway, which also affords means of transportation to and from their work for the employees of the company residing at Ladysmith.

### Ladysmith.

The general shipping-point for the output of these mines is Ladysmith, where the coal is either loaded on vessels or sent to Mainland points in railway-cars by means of transfer-barges. The coal-washery is equipped with three washers, each having a computed capacity of 200 tons in twelve hours, 6-compartment jigs, and four 14- by 7-foot Mascoe tables taking care of the smaller-sized coal. Power for the washery is supplied by a Pelton wheel. Provisions are made to replace the ordinary fresh-water supply by salt water in case of abnormally cold weather. A 40-kw., 240-volt Allis-Chalmers-Bullock generator is furnishing the power for lighting purposes to the washery and wharves.

### Extension Colliery.

William Roper, Manager.

The workings of this colliery are situated partly in the Cranberry and partly in the Douglas districts. Here the Wellington seam underlies an area some 2 miles in width at its south-east end, in the vicinity of the Nanaimo river, and extending about 4 miles in a north-westerly direction. The presence of coal in this section was accidentally discovered in the year 1895 and rapid development followed.

All the Extension mines are in the western limb of an important anticline, the axis of which is closely followed by the Extension valley. The field is traversed by several minor folds, all running in a north-westerly direction, as do the two major faults. Of the latter, that separating Nos. 1 and 6 mines from Nos. 2 and 3 is by far the most important, both as to continuity and displacement, its throw sometimes approaching 500 feet. At some points it has a comparatively low dip to the south-west and there assumes all the characteristics of an overthrust. As a result of the intense folding the edges of the basin are turned up rather sharply and the highest dips are generally met in the vicinity of the outcrops.

Many dislocations of varying magnitude are encountered in the course of mining operations, as are also "rolls," "wants," and barren ground.

The entire output of Nos. 1 and 2 mines is brought to the tipple through a rock tunnel, driven 14 by 7 feet in the clear on a 1-per-cent. grade, which meets No. 1 mine at a distance of three-quarters of a mile from the portal. It continues from there to No. 2 mine, a total distance of 1¼ miles. Haulage is done by electric locomotives of the overhead-trolley type. The underground employees are taken to and from their work in man-trips hauled by a 13-ton Baldwin-Westinghouse electric locomotive.

No. 6 mine is situated about 1¼ miles to the north-west of the Main tunnel and connected by a narrow-gauge railway about a mile in length and an incline 3,000 feet long. This mine was closed down permanently during the year.

*Power-house.*—The boiler plant consists of four Goldie & McCulloch return-tubular boilers of 163 horse-power each. The electric power is supplied by three 250-volt d.c. generators. No. 1 is a Crocker-Wheeler of 112.5-kw. capacity, direct-coupled to a 15 by 14 Ideal engine; No. 2 is a 150-kw., direct-connected to a 14 by 14 by 32 Fleming-Harrisburg compound engine; No. 3 is a 150-kw. General Electric, direct-connected to a 16 by 16 Robb-Armstrong engine. A Black fire-supply pump 12 by 18 by 10 is maintained in good order in the boiler-house.

*Wash-house.*—This is a steam-heated building, providing accommodation for more than 400 men and equipped with thirty-six spray-baths, a number of hot- and cold-water taps, and a dry-room. Separate lockers and wash-rooms are provided for the firebosses and other officials.

### First Aid and Mine-rescue.

Well-attended first-aid classes are conducted every year; consequently there are a large number of certificated men always available at the colliery. At Extension there is a well-equipped first-aid room and a well-appointed ambulance railway-car which is kept in readiness at all times.

Both first-aid and mine-rescue teams represented the Extension mines at the Labour Day competitions, under the auspices of the Vancouver Island branch of the B.C. Mine Safety Association, and met with a fair amount of success, their work being highly creditable and showing much careful training.

### No. 1 Mine.

William Roper, Mine Manager; Thos. Wilson, Overman; W. Bauld, D. Gordon, D. Copeland, John Greenhorn, Harry Mitchell, and Andrew Orr, Firebosses.

The workings of this mine are known as the No. 4 East and the West incline. The position of the fan is far from being in an advantageous position for the mine-workings to-day and cannot supply a sufficient quantity of air to No. 4 East heading. This section is supplied by a 5-foot Stine fan driven by a 15-horse-power d.c. motor. This fan serves as a "booster." During the winter there is a heavy inflow of water, which is fairly satisfactorily dealt with by two electric pumps.

In No. 4 East the coal is worked on the long-wall system; the height of the seam varies from 2 to 12 feet, with bands of dirt running between the coal. This heading has been driven a distance of 1,000 feet during the year and is now about 120 feet from the outcrop. The slants to the raise are about 400 feet in length. The dip slant, which is down 560 feet, is opening a large area of solid ground, the coal being hauled by electric winch; a small centrifugal pump takes care of the water.

The West incline is limited to a strip of coal about 350 feet in width, next to the fault. The coal is very thick and pillars are being extracted on a retreating system; the coal-seam being so high makes the operation very difficult; but so far operations have been carried on with satisfactory results, both as regards safety and recovery. The slope in this section was driven 2,000 feet; about 300 feet of this has been worked out.

The haulage equipment consists of one Ottumwa hoist, driven by a 100-horse-power d.c. motor. Two small electric hoists are operating in the West Incline section. The mine is ventilated by twin fans of the Murphy type, driven by an Allis-Chalmers-Bullock motor, and passing 65,000 cubic feet of air a minute, against a water-gauge of 0.75 inch; the booster in No. 4 East passing 15,000 cubic feet a minute.

In the course of the December inspection this mine was found to be in general good order; no gas was found and the ventilation, timbering, and roadways were in good order. The mine is naturally damp and practically free from coal-dust.

No dangerous occurrences were reported from this mine during 1927 and it is a pleasure to report that no fatal accident occurred during the year 1927.

### No. 2 Mine.

William Roper, Mine Manager; Robt. L. Spruston, Overman; Wm. Gilchrist, Edward Heyes, Jos. Watson, R. L. Hamilton, O. Dabb, Jas. Nimmo, Hudson Yeowart, and Patrick Malone, Firebosses.

This is the most extensive mine and is grouped in four widely separated sections, known as No. 17 Incline, No. 2 Incline, East Incline, and Old Slope. In the East incline all operations are limited to pillar-extraction; the large amount of cogging and stowing done in previous operations has added to the success of the undertaking and the freedom of accidents and the large percentage of recovery reflects great credit on the officials in charge. This district has an independent intake and 6,000 cubic feet of air is passing for the use of eighteen men and two horses.

In No. 2 incline there are a few pillars left to be taken out; these vary in thickness and quality, due to being very close to the outcrop. In No. 17 incline the seam is very irregular; about 5 feet of rock separates the top and bottom benches of coal, the roof is mostly shale, and the whole district very wet. The Diagonal slope in this district has been driven to the outcrop; the opening has greatly assisted the ventilation and provided an outlet for the water produced in this section, most of which can now be removed by siphon to the surface. No. 3 East has been connected with No. 21 incline and the extraction of pillars is being carried on successfully. In the lower portion of No. 17 the pillars left by previous operations, being considered too dirty, are now being worked out. In the Old Slope district, where pillar-extraction is general, the inside workings are reached by a long haulage-road which is hard to maintain.

The workings to the rise are in good coal. In the December visit of inspection explosive gas was found in one of the rise workings, but was receiving the attention of the mine officials.

The haulage and pumping equipment consists of three small electric winches which haul the coal to the Main level, which is then taken to the tipple by electric locomotives.

A large electrically driven centrifugal pump, delivering about 1,000 gallons a minute, takes care of the water made in the mine.

### New Vancouver Slope.

William Roper, Mine Manager; Thos. Strang, Overman; David Davidson and Thos. Hunter, Firebosses.

The object of operations at this mine is to recover top coal and pillars supposed to have been left at the time of abandonment twenty-five years ago. The slope has been driven 1,000 feet through the heavily caved ground and occasional small stumps of coal. The levels have had to be driven through similar conditions and are in about 400 feet. There is supposed to be some solid ground on the right side of the slope, in the direction of the fault, also ahead of the old No. 3 West level. The future of the mine depends on the amount of solid coal that may be found in the areas where it is supposed to have been left by former operators. The mine is ventilated by No. 3 fan, which induces sufficient circulation to meet the present requirements.

The haulage equipment consists of a steam-hoist of about 100 horse-power, a small electric hoist, and a plunger-pump electrically driven by a 15-horse-power d.c. motor which supplies water for the portable boilers.

The mine is connected by a gravity-incline, about 1,000 feet long, to the F. Beban Lumber Company's railway, over which the coal is brought to Extension. At the foot of the incline the mine-cars are dumped at the tipple over a screening device, passing into the railway-cars for shipment.

No explosive gas has been found in the mine, but on June 4th, 1927, black-damp was reported in the slope and men withdrawn. At the time of my last examination the mine was in good order as regards ventilation and timbering and 12,000 cubic feet of air was passing into the mine for the use of eleven men.

### No. 8 Mine.

R. Houston, Overman; William Clifford, William Strang, and J. Morgan, Firebosses.

This mine is located on Range 1, Section 1, Cranberry District, and in close proximity to McKay's lake and Nanaimo river. The operation at present is composed of two slopes, one of which has been driven on the outcrop of the seam and is known as No. 1 slope; No. 2 slope is in its development stage and has been driven about 500 feet in very hard conglomerate rock.

No. 1 slope is down a distance of 300 feet and paralleling a fault on the left side where a large downthrow fault was met with in the face of the slope. Work is now concentrated on the right of the slope by driving a pair of levels and a side-slope off the same, with rise stalls driven up the pitch. The coal is of an excellent quality and varies in thickness from 2 to 4 feet. The pitch of the seam in this operation is about 65°.

The No. 2 slope is being driven with the view to opening up a territory lying between No. 1 slope and the north-western outcrop, and which has been proven by boreholes and several outcrops in the field.

The output of the mine is taken over the Timberland railway to Haslam flat, where it connects with the Canadian Collieries (Dunsmuir), Limited, railway, about 4½ miles from Ladysmith, the shipping-point.

Transportation of the employees to and from the mine from Lockner's Crossing is made by automobile or jitney over what was formerly an old diamond-drill road, but negotiations are under way toward having the Provincial Government build a new road.

The surface plant consists of the following equipment: A power-house with two 18 by 72 return-tubular boilers of 160 horse-power each, one air-compressor, a small generating-set, ventilating-fan, and one double-drum steam-hoist, 100 horse-power.

Edison electric cap-lamps are used exclusively by the workmen; the officials are supplied with Wolf safety-lamps for gas-testing purposes.

When inspected in December this operation was in good condition. No gas found and the ventilation, timbering, and roadways were in good order. The mine being naturally damp is practically free from coal-dust.

No dangerous occurrence was reported during the year and it is a pleasure to report that no fatal accident occurred at this mine during 1927.

The following are the official returns from the Extension Colliery for the year ended December 31st, 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 115,014 | ..... | ..... | ..... |
| Sold for export to United States | 41,076 | ..... | ..... | ..... |
| Sold for export to other countries | ..... | ..... | ..... | ..... |
| Total sales | ..... | 156,090 | ..... | ..... |
| Used in making coke | ..... | ..... | ..... | ..... |
| Lost in washing | 30,897 | ..... | ..... | ..... |
| Used under colliery boilers, etc | 15,969 | ..... | ..... | ..... |
| Total for colliery use | ..... | 46,866 | ..... | ..... |
| | | 202,956 | | |
| Stocks on hand first of year | 6,611 | ..... | ..... | ..... |
| Stocks on hand last of year | 11,492 | ..... | ..... | ..... |
| Difference added to stock during year | ..... | 4,881 | ..... | ..... |
| Output of colliery for year | ..... | 207,837 | ..... | ..... |

Number of Hands employed, Daily Wages paid, etc.

| Character of Labour. | Underground. | | Above Ground. | | Totals. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| Supervision and clerical assistance | 21 | ..... | 13 | ..... | 34 | ..... |
| Whites— | | | | | | |
| Miners | 299 | ..... | ..... | ..... | 299 | ..... |
| Miners' helpers | 13 | ..... | ..... | ..... | 13 | ..... |
| Labourers | 93 | ..... | 30 | ..... | 123 | ..... |
| Mechanics and skilled labour | 17 | ..... | 61 | ..... | 78 | ..... |
| Boys | ..... | ..... | 16 | ..... | 16 | ..... |
| Japanese | ..... | ..... | ..... | ..... | ..... | ..... |
| Chinese | 6 | ..... | 68 | ..... | 74 | ..... |
| Indians | ..... | ..... | ..... | ..... | ..... | ..... |
| Totals | 449 | ..... | 188 | ..... | 637 | ..... |

Report by J. W. Jemson, Inspector.

## WELLINGTON EXTENSION No. 5 MINE, SOUTH WELLINGTON.

William Wesnedge, Mine Manager; William Brown, Overman; D. Caldwell, Robt. Ewing, Neil McIntyre, and Thos. Robson, Firebosses.

This mine, situated in the Cranberry district near the South Wellington Station on the Esquimalt & Nanaimo Railway, is operated in the Douglas seam and adjoins the old Alexandria mine, from which it is separated by a barrier-pillar having a minimum breadth of 300 feet. The seam varies greatly in thickness and quality. The weak sandy-shale floor shows much more

frequent irregularities than does the roof, which is generally sandy shale. "Pinches" and "wants" are very common.

The shipping facilities at the mine are excellent owing to its close proximity to the Esquimalt & Nanaimo Railway, to which it is connected by a spur line. The coal is sent over this road to the Canadian Collieries shipping centre at Ladysmith, from which it is distributed.

The tipple is provided with a revolving dump, chain car-haul, shaker screens, picking-table, loading-boom, and a scraper conveyor for the boiler-fuel. The power plant consists of four Goldie & McCulloch return-tubular boilers, each having a rating of 165 horse-power; two 250-volt d.c. 112-kw. generators—one a Crocker-Wheeler direct-connected to a 15 by 14 Ideal engine, the other an Allis-Chalmers direct-coupled to a 16 by 16 Skinner engine; and a Sullivan air-compressor.

The entire output is hauled up the Main slope by a first-motion steam-hoist, 18 by 36 cylinders, situated on the surface. The coal is brought to the foot of the Main slope by a main-and-tail system installed during the year, which dispensed with the electric hoist at No. 3 North Diagonal slope.

Considerable surface water finds its way into the mine during the wet season, causing more or less inconvenience and expense. At No. 6 South the old level has been transformed into a sump by erecting a concrete dam at its entrance, where two pumps are stationed to take care of the surplus water issuing from the old workings. The main pumping installation consists of a 6-inch 7-stage turbine-pump, having a capacity of 360 gallons a minute, which discharges to the surface through a borehole about 460 feet deep.

The mine is ventilated by a 60-inch single-inlet Keith fan, electrically driven and having a capacity of 60,000 cubic feet a minute, against a water-gauge of 1 inch. At the time of the December examination 28,500 cubic feet a minute was passing on the Main slope for the use of fifty-one men and six horses. Only on one or two occasions during the year has explosive gas been found; the mine is generally well timbered.

All the inside workings consist of pillar-extraction, the only solid work being down the Main slope, which has encountered several "wants," but is now in fair coal.

A well-appointed first-aid room and a motor-ambulance are provided at the mine. This mine has been remarkably free from serious accidents.

The following are the official returns from the Wellington Extension No. 5 mine for the year ended December 31st, 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 53,006 | | | |
| Sold for export to United States | | | | |
| Sold for export to other countries | | | | |
| Total sales | | 53,006 | | |
| Used in making coke | | | | |
| Lost in washing | 15,876 | | | |
| Used under colliery boilers, etc | 4,880 | | | |
| Total for colliery use | | 20,756 | | |
| | | 73,762 | | |
| Stocks on hand first of year | | | | |
| Stocks on hand last of year | | | | |
| Difference added to (or taken from) stock during year | | | | |
| Output of colliery for year | | 73,762 | | |

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

| Character of Labour. | UNDERGROUND. | | ABOVE GROUND. | | TOTALS. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| Supervision and clerical assistance | 5 | | | | 5 | |
| Whites— | | | | | | |
| Miners | 72 | | | | 72 | |
| Miners' helpers | | | | | | |
| Labourers | 30 | | 18 | | 48 | |
| Mechanics and skilled labour | 5 | | 5 | | 10 | |
| Boys | | | 10 | | 10 | |
| Japanese | | | | | | |
| Chinese | | | | | | |
| Indians | | | | | | |
| Totals | 112 | | 33 | | 145 | |

REPORT BY J. W. JEMSON, INSPECTOR.

## WELLINGTON EXTENSION No. 9 MINE.

Geo. O'Brien, Mine Manager; J. G. Hindmarch, S. K. Mottishaw, and Geo. Stewart, Firebosses.

This mine is operated by the Canadian Collieries (Dunsmuir), Limited, and is situated about 6 miles from the city of Nanaimo in a northerly direction. It was formerly operated by the King & Foster Coal Company, and known as the Island Collieries, Limited.

The seam is now being operated in the well-known Wellington upper seam on the long-wall system, as it is the only system applicable to the local conditions. The seam varies from 14 to 20 inches and is of remarkably good quality.

The output at the present time averages about 100 tons a day, but it is expected to almost double that in the near future. The haulage from the faces to the partings is done by mules, but when the compressor is installed small winches will replace animal haulage in many cases. The Main slope haulage is direct rope-haulage. The mine being situated about a mile from the tipple, a narrow-gauge railway is in operation for the purpose of transporting the coal from the mine to the tipple, a 6-ton steam-locomotive being used for this purpose, operating on a 30-inch-gauge track and hauling 20-car trips. The mine is ventilated by a Keith fan, giving 12,000 cubic feet of air a minute.

The cover over the seam is very thin (about 30 feet), which is badly fissured owing to the extraction of pillars in the lower seam by previous operations. All workmen use the Edison storage-battery cap-lamp underground, while the officials are provided with flame safety-lamps of the Wolf type for gas-inspection purposes, and all shot-firing is done by certificated officials with single shot-firing battery and cable. The mine is free from coal-dust, as the mine is naturally damp, and during the wet season a large quantity of surface water percolates through the strata.

Many improvements have taken place during the last few months and further improvements are being carried on at the present time. A new pit-head landing is almost completed, which will facilitate the handling of cars on the pit-head.

A 10- by 14-inch Ottumwa steam-hoist, geared 5 to 1, with a 4-foot-diameter drum having 6-inch flanges, has been installed for the Main slope haulage. A 75-horse-power Waterous return-tubular boiler has also been installed, and a Rand-Ingersoll air-compressor with a capacity of 1,200 cubic feet of free air is being installed for the purpose of supplying power for air-drills, hoists, pumps, etc.

A large building has been erected which will house the boilers, compressor, generating plant, blacksmith-shop, machine-shop, etc., centralizing these several units.

A rock-bunker for the purpose of handling mine-refuse is also under construction. Owing to the large amount of refuse that has to be shipped daily to the surface a quick method of disposal is absolutely necessary. An extension of the barn is contemplated, as future development will require the housing of several more mules or horses. On the whole the prospects for the successful operation of this mine appear fairly bright.

During the course of the December examination the mine was in general good order. No explosive gas has been found.

In this mine 11,000 cubic feet of air was passing for the use of thirty-four men and four horses. The workmen at this mine availed themselves of the opportunity provided by the provisions of section 101, Rule 37, "Coal-mines Regulation Act," and appointed their own representatives to examine the mine. Inspections have been made regularly and reports of inspections sent to this office.

It is a pleasure to report that no fatal accidents occurred at this mine, though one serious accident happened on the surface to a lampman while helping to lift a derailed car.

The following are the official returns from the Wellington Extension No. 9 mine for the year ended December 31st, 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 4,917 | | | |
| Sold for export to United States | | | | |
| Sold for export to other countries | | | | |
| Total sales | | 4,917 | | |
| Used in making coke | | | | |
| Lost in washing | 436 | | | |
| Used under colliery boilers, etc. | 290 | | | |
| Total for colliery use | | 726 | | |
| | | 5,643 | | |
| Stocks on hand first of year | | | | |
| Stocks on hand last of year | | | | |
| Difference added to (or taken from) stock during year | | | | |
| Output of colliery for year | | 5,643 | | |

Number of Hands employed, Daily Wages paid, etc.

| Character of Labour. | Underground. | | Above Ground. | | Totals. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| Supervision and clerical assistance | 3 | | 2 | | 5 | |
| Whites— | | | | | | |
| Miners | 51 | | | | 51 | |
| Miners' helpers | 2 | | | | 2 | |
| Labourers | 17 | | 26 | | 43 | |
| Mechanics and skilled labour | 2 | | 11 | | 13 | |
| Boys | | | | | | |
| Japanese | | | | | | |
| Chinese | | | | | | |
| Indians | | | 2 | | 2 | |
| Totals | 75 | | 41 | | 116 | |

REPORT BY J. W. JEMSON, INSPECTOR.

## FIDDICK MINE.

T. Fiddick, Superintendent; Jas. Handlin, Fireboss.

This mine is situated on the site formerly worked by the Pacific Coast Coal Company, near to South Wellington Station on the Esquimalt & Nanaimo Railway. It is estimated that a few thousand tons of coal can be recovered from the property if careful mining methods are observed. The coal is overlaid by a thin cover of soft shale and gravel; numerous caves have occurred in the old workings, which are plainly seen on the surface.

A slope has been driven from the surface to a large pillar of coal; this is intended for a haulage-way. No power has been resorted to so far, as the grade of the slope is slight, enabling the output to be hauled by a horse. The seam at this point is about 8 feet thick and of very good quality; it finds a ready market for domestic use in Nanaimo and district. A temporary screening arrangement has been erected for sizing the coal at the mouth of the tunnel. The mine is ventilated by natural means, there being several openings to the surface. Safety-lamps of the Wolf type are used underground. "Permitted explosives" are used and all shots fired by electric detonators under the supervision of a competent person appointed for the purpose.

The following are the official returns from the Fiddick mine for the year ended December 31st, 1927:—

| SALES AND OUTPUT FOR YEAR. | COAL. | | COKE. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 276 | ..... | ..... | ..... |
| Sold for export to United States | ..... | ..... | ..... | ..... |
| Sold for export to other countries | ..... | ..... | ..... | ..... |
| Total sales | ..... | 276 | ..... | ..... |
| Used in making coke | ..... | ..... | ..... | ..... |
| Used under colliery boilers, etc | ..... | ..... | ..... | ..... |
| Total for colliery use | ..... | ..... | ..... | ..... |
| Stocks on hand first of year | ..... | ..... | ..... | ..... |
| Stocks on hand last of year | ..... | ..... | ..... | ..... |
| Difference added to (or taken from) stock during year | ..... | ..... | ..... | ..... |
| Output of colliery for year | ..... | 276 | ..... | ..... |

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

| Character of Labour. | UNDERGROUND. | | ABOVE GROUND. | | TOTALS. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| | | $ | | $ | | $ |
| Supervision and clerical assistance | ..... | ..... | ..... | ..... | ..... | ..... |
| Whites— | | | | | | |
| Miners | 2 | 5.00 | ..... | 4.00 | 2 | 5.00 |
| Miners' helpers | ..... | ..... | ..... | ..... | ..... | ..... |
| Labourers | ..... | ..... | 1 | ..... | 1 | 4.00 |
| Mechanics and skilled labour | ..... | ..... | ..... | ..... | ..... | ..... |
| Boys | ..... | ..... | ..... | ..... | ..... | ..... |
| Japanese | ..... | ..... | ..... | ..... | ..... | ..... |
| Chinese | ..... | ..... | ..... | ..... | ..... | ..... |
| Indians | ..... | ..... | ..... | ..... | ..... | ..... |
| Totals | 2 | ..... | 1 | ..... | 3 | ..... |

Report by J. W. Jemson, Inspector.

## DIAMOND JUBILEE MINE.

Harry Shepherd, Superintendent and Fireboss.

This mine is situated at the entrance to Nanoose bay, on Lot 54, Alberni District, and almost adjoins the property of the abandoned Nanoose Wellington Coal Company.

The Diamond Jubilee slope is near an old prospect-tunnel which was driven many years ago into the Upper Wellington seam, which outcrops here on the shore. The slope has advanced about 300 feet, developing the property and bearing 10° west of south. The coal-seam averages about 20 inches and is of good quality, finding a ready market in Nanaimo and district. The natural conditions are favourable to long-wall working, as there is a good roof (conglomerate).

It is proposed to prove the Lower Wellington seam by boreholes on the property in the near future. No power of any kind has been employed so far, but an air-compressor would be very useful for haulage and drilling purposes.

The mine is in good working condition and the requirements of the coal-mine regulations carefully observed.

The following are the official returns from the Diamond Jubilee mine for the year ended December 31st, 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 282 | ..... | ..... | ..... |
| Sold for export to United States | ..... | ..... | ..... | ..... |
| Sold for export to other countries | ..... | ..... | ..... | ..... |
| Total sales | ..... | 282 | ..... | ..... |
| Used in making coke | ..... | ..... | ..... | ..... |
| Used under colliery boilers, etc. | ..... | ..... | ..... | ..... |
| Total for colliery use | ..... | ..... | ..... | ..... |
| Stocks on hand first of year | ..... | ..... | ..... | ..... |
| Stocks on hand last of year | ..... | ..... | ..... | ..... |
| Difference added to (or taken from) stock during year | ..... | ..... | ..... | ..... |
| Output of colliery for year | ..... | 282 | ..... | ..... |

Number of Hands employed, Daily Wages paid, etc.

| Character of Labour. | Underground. | | Above Ground. | | Totals. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| Supervision and clerical assistance | ..... | ..... | 1 | ..... | 1 | ..... |
| Whites— | | | | | | |
| Miners | 3 | ..... | ..... | ..... | 3 | ..... |
| Miners' helpers | ..... | ..... | ..... | ..... | ..... | ..... |
| Labourers | ..... | ..... | ..... | ..... | ..... | ..... |
| Mechanics and skilled labour | ..... | ..... | ..... | ..... | ..... | ..... |
| Boys | ..... | ..... | ..... | ..... | ..... | ..... |
| Japanese | ..... | ..... | ..... | ..... | ..... | ..... |
| Chinese | ..... | ..... | ..... | ..... | ..... | ..... |
| Indians | ..... | ..... | ..... | ..... | ..... | ..... |
| Totals | ..... | ..... | ..... | ..... | 4 | ..... |

Report by Thos. R. Jackson, Inspector.

## Granby Consolidated Mining, Smelting and Power Co., Ltd.

J. T. Crabbs, President, New York City; Chas. Bocking, Vice-President, Vancouver, B.C.; H. Harvey, Secretary, New York City; H. R. Plommer, Treasurer, Vancouver, B.C.; Robert Henderson, Superintendent, Cassidy, B.C.

## No. 1 MINE.

Robert Henderson, Manager; Alex. McLaughlin, Overman; Albert Radford, Matthew Meek, Tom Bullen, James McGrath, and Fritz John, Firebosses.

Granby Colliery No. 1 mine is situated about 9 miles in a southerly direction from Nanaimo. The main entrance to the mine is by a slope 7 by 14 feet in the clear to allow for a double track and is timbered by 12- by 14-inch framed sets, 4 feet centre to centre. A separate manway is provided for a travelling-road and it at the same time forms an intake airway. The Douglas seam, which varies from 3 to 20 feet in thickness, is worked at this mine and the system of work adopted is pillar and stall.

The mine is ventilated by a Sirocco fan having a capacity of 150,000 cubic feet a minute, with a 3.5-inch water-gauge. This fan is driven by a 150-horse-power Westinghouse electric motor. The main hoist is a Vulcan 18- by 36-inch double-drum, second-motion hoist. The mine-cars are large and have a carrying capacity of 1.75 tons of coal. No mules or horses are used in the mine. Compressed air is used underground for the driving of drills, pumps, and winches. A Rand cross-compound condensing compressor, with capacity of 2,000 cubic feet of air a minute, furnishes the power. Electric power is supplied by an Allis-Chalmers 450-kw. generator (2,300-volt, 3-phase, 60-cycle, 300 r.p.m.), both direct-connected to vertical high-speed engines of the Goldie & McCulloch type. The remainder of the electric equipment is of the Westinghouse type. A Worthington fire-pump, capacity of 1,000 gallons a minute, size 18 by 10 by 12 inches, is kept in readiness for emergency.

A large house called the "change-house" is used by the miners for the purpose of changing their clothes. An attendant is in charge whose duty it is to keep the place clean, well ventilated, and heated. The heat produced in the drying-room is sufficient to make the mine clothes perfectly dry and comfortable for the workmen to don before they go to work in the mine. The change-house is equipped with steel lockers, which are heated by steam-coils underneath. There are shower-baths and large lavatory, including every convenience for the workmen.

The intake air is heated by exhaust steam passing through radiators and allowed to travel down the mine, thus to some extent preventing the drying-out of the mine. Very fine fog sprays are placed about 150 feet apart on the Main slope and these operate automatically for twenty minutes out of every hour. Farther in the mine the main roadways are liberally treated with inert dust and water to such extent that the sample tests for coal-dust show an incombustible content in compliance with the requirements of the "Coal-mines Regulation Act."

Edison head-lamps are used by the employees, except in the case of officials, who use the Wolf flame safety-lamp for testing purposes.

Since May, 1925, the extraction of pillars has been general. Only one blowout has occurred this year in the mine—a very feeble disruption at that—more like a "push-out" of the coal. It took place in the South side main pillar of the slope while they were splitting it with a roadway from the counter to the Main slope.

During December I visited this mine on two separate occasions and found the general conditions of the mine to be good.

The fire area in No. 4 North district which had been sealed off for some time has been reopened and the extraction of pillars resumed under normal atmospheric conditions. No after-math of the fire has so far made its appearance.

The power-motor of the fan has been adjusted to decrease the quantity of air generated by the fan. I found a total quantity of 97,000 cubic feet of air a minute passing into this mine, made up as follows: Main slope entrance equals 75,000; Manway entrance equals 22,500.

The general state of the roadways and timbering were found to be good; so was the ventilation. The flow of gas from the mine is very limited now; the analysis of the mine-air sample tests taken at the fan and the adjacent main returns show an average of about 0.25 per cent. methane.

I found about 30 cubic feet of explosive gas in bottom place of No. 5 South slope (rise side of roadway at face). No explosives are used in this place.

The writer regrets to state that three fatal accidents took place at this colliery during the year; two on the haulage and one due to a fall of rock at the face.

The analysis of mine coal-dust samples submitted to this office were considerably better in ash content than what is specified by the "Coal-mines Regulation Act."

In the North side split the quantity of air passing in cubic feet a minute equals 14,000 for forty men; in South side split the quantity of air passing in cubic feet a minute equals 6,000 for twenty men.

The various books kept at the mine in compliance with the "Coal-mines Regulation Act" were examined and found to be in order.

The following are the official returns for the Granby Colliery for the year ended December 31st, 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 128,217 | ..... | ..... | ..... |
| Sold for export to United States | 7,606 | ..... | ..... | ..... |
| Sold for export to other countries | ..... | ..... | ..... | ..... |
| Total sales | ..... | 135,823 | ..... | ..... |
| Used in making coke | ..... | ..... | ..... | ..... |
| Lost in washing | 38,355 | ..... | ..... | ..... |
| Used under colliery boilers, etc | 12,563 | ..... | ..... | ..... |
| Total for colliery use | ..... | 50,918 | ..... | ..... |
| | | 186,741 | | |
| Stocks on hand first of year | 2,580 | ..... | ..... | ..... |
| Stocks on hand last of year | 6,492 | ..... | ..... | ..... |
| Difference added to stock during year | ..... | 3,912 | ..... | ..... |
| Output of colliery for year | ..... | 190,653 | ..... | ..... |

Number of Hands employed, Daily Wages paid, etc.

| Character of Labour. | Underground. | | Above Ground. | | Totals. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| | | $ | | $ | | $ |
| Supervision and clerical assistance | 5 | 6.00 | 8 | 5.50 | 13 | 5.70 |
| Whites— | | | | | | |
| Miners | 108 | 6.64 | ..... | ..... | 108 | 6.64 |
| Miners' helpers | ..... | ..... | ..... | ..... | ..... | ..... |
| Labourers | 59 | 4.16 | 26 | 3.50 | 85 | 3.96 |
| Mechanics and skilled labour | ..... | ..... | 22 | 5.10 | 22 | 5.10 |
| Boys | ..... | ..... | 5 | 1.50 | 5 | 1.50 |
| Japanese | ..... | ..... | ..... | ..... | ..... | ..... |
| Chinese | ..... | ..... | ..... | ..... | ..... | ..... |
| Indians | ..... | ..... | ..... | ..... | ..... | ..... |
| Totals | 172 | ..... | 61 | ..... | 233 | ..... |

Report by J. W. Jemson, Inspector.

## East Wellington Coal Company.

H. G. Heisterman, President, Victoria, B.C.; P. S. Fagan, Secretary-Treasurer, Victoria, B.C.

### EAST WELLINGTON COLLIERY.

William Wilson, Manager; Walter Joyce, Overman; Geo. Grey, C. Webber, D. McMillan, and Jos. Wilson, Firebosses.

This mine, situated in the Mountain district, is operated in the Wellington seam. Its territory extends from the boundary of the Jingle Pot to the abandoned workings of the Chandler mine operated in the late nineties.

In the present workings the seam seldom exceeds 2 feet in thickness and is of good quality. The seam is reached by two slopes, 1,320 and 1,220 feet in length respectively, of which the former is the main haulage-road and intake, the other being used as a return airway. The Main slope has a gradient averaging 25°. The workmen travel in and out of the mine in a special trip of cars, reserved for that purpose only, all connected, in addition to the ordinary couplings, by a ⅞-inch steel rope running through the whole train and connected to the main rope shackling.

The long-wall system is used throughout the mine and the coal is undermined by Sullivan chain-cutters and loaded by hand. The present workings consist of two walls of rather limited extent. The main wall is within 150 feet of the boundary; therefore the life of the mine is rapidly drawing to a close. Gateways are driven on 32-foot centres, the bottom is brushed, and the roof secured by pack-walls and alternate cogs. This method provides an ample supply of stowing material. At the faces the method of timbering is that commonly known as "post and strap"; this allows clearance for the operation of the coal-cutters. The roof is sandy shale, occasionally weak, consequently requiring careful timbering and attention.

The entire output is brought to the Main slope by a main and tail haulage. All underground machinery is operated by compressed-air, except the Main slope pumps, which are steam-driven.

The prospecting operations carried on during the years 1926 and 1927 in the Lower and Upper seams, involving a great deal of expense, have been abandoned. The amount of development-work done during the year 1927 was 600 feet in the Lower seam and 1,200 feet in the Upper seam, and various diamond-drill holes proving the Lower seam.

The power plant consists of four return-tubular boilers, with an aggregate rating of 476 horse-power; two Canadian Rand tandem compressors of 550 cubic feet capacity each; one Norwalk tandem compressor, capacity 1,650 cubic feet; and two small electric generators supply power for lighting, charging of lamp-batteries, etc.

Electric cap-lamps are used exclusively by the workmen, while for inspection by the mine officials safety-lamps of the Wolf type are used.

At the time of the last inspection in December 20,000 cubic feet of air was passing into the mine for the use of forty-three men and three horses. On several occasions explosive gas was found on the long-wall faces and in the prospect-tunnels. On each occasion steps were immediately taken by the management to remedy the defects.

Two serious accidents were reported to this office during the year. George Chilton, driller, received injuries to the spine by a fall of roof while drilling a hole in the brushing. Walter Joyce, overman, sustained a fractured leg while helping to move a coal-cutting machine.

The workmen at this mine availed themselves of the opportunity provided by the "Coal-mines Regulation Act," section 101, Rule 37, and appointed their own representatives to examine the mine. Inspections have been made regularly and reports sent to this office.

The following are the official returns from the East Wellington Colliery for the year ended December 31st, 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 38,072 | ..... | ..... | ..... |
| Sold for export to United States | ..... | ..... | ..... | ..... |
| Sold for export to other countries | ..... | ..... | ..... | ..... |
| Total sales | ..... | 38,072 | ..... | ..... |
| Used in making coke | ..... | ..... | ..... | ..... |
| Lost in washing | 1,074 | ..... | ..... | ..... |
| Used under colliery boilers, etc | 8,279 | ..... | ..... | ..... |
| Total for colliery use | ..... | 9,353 | ..... | ..... |
| | | 47,425 | ..... | ..... |
| Stocks on hand first of year | ..... | ..... | ..... | ..... |
| Stocks on hand last of year | 29 | ..... | ..... | ..... |
| Difference added to stock during year | ..... | 29 | ..... | ..... |
| Output of colliery for year | ..... | 47,454 | ..... | ..... |

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

| Character of Labour. | Underground. | | Above Ground. | | Totals. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| Supervision and clerical assistance | 2 | ..... | 3 | ..... | 5 | ..... |
| Whites— | | | | | | |
| Miners | 44 | ..... | ..... | ..... | 44 | ..... |
| Miners' helpers | ..... | ..... | ..... | ..... | ..... | ..... |
| Labourers | 39 | ..... | 4 | ..... | 43 | ..... |
| Mechanics and skilled labour | 15 | ..... | 7 | ..... | 22 | ..... |
| Boys | 6 | ..... | 6 | ..... | 12 | ..... |
| Japanese | ..... | ..... | ..... | ..... | ..... | ..... |
| Chinese | ..... | ..... | 11 | ..... | 11 | ..... |
| Indians | ..... | ..... | ..... | ..... | ..... | ..... |
| Totals | 106 | ..... | 31 | ..... | 137 | ..... |

REPORT BY JAMES W. JEMSON, INSPECTOR.

## King & Foster Coal Co., Ltd.

(ISLAND COLLIERIES, LTD.)

Head Office—Herald Building, Nanaimo, B.C.

### No. 2 MINE.

Henry Shepherd, Superintendent; S. K. Mottishaw, Manager; John Michel and G. Stewart, Firebosses.

This operation is in the Wellington seams near Wellington and the workings of No. 2 mine were confined to the Upper seam. The coal throughout the mine was mined by the long-wall system.

This mine was closed down in January, 1927, and was later acquired by the Canadian Collieries (Dunsmuir), Limited, which operated the property under the name of No. 9 mine.

The following are the official returns from the King & Foster Coal Company, Limited, for the year ended December 31st, 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 546 | ..... | ..... | ..... |
| Sold for export to United States | ..... | ..... | ..... | ..... |
| Sold for export to other countries | ..... | ..... | ..... | ..... |
| Total sales | ..... | 546 | ..... | ..... |
| Used in making coke | ..... | ..... | ..... | ..... |
| Used under colliery boilers, etc | ..... | ..... | ..... | ..... |
| Total for colliery use | ..... | ..... | ..... | ..... |
| Stocks on hand first of year | ..... | ..... | ..... | ..... |
| Stocks on hand last of year | ..... | ..... | ..... | ..... |
| Difference added to (or taken from) stock during year | ..... | ..... | ..... | ..... |
| Output of colliery for year | ..... | 546 | ..... | ..... |

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

| Character of Labour. | Underground. | | Above Ground. | | Totals. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| Supervision and clerical assistance | 3 | ..... | 3 | ..... | 6 | ..... |
| Whites— | | | | | | |
| Miners | 31 | ..... | ..... | ..... | 31 | ..... |
| Miners' helpers | ..... | ..... | ..... | ..... | ..... | ..... |
| Labourers | 12 | ..... | 16 | ..... | 28 | ..... |
| Mechanics and skilled labour | ..... | ..... | 6 | ..... | 6 | ..... |
| Boys | 1 | ..... | ..... | ..... | 1 | ..... |
| Japanese | ..... | ..... | ..... | ..... | ..... | ..... |
| Chinese | ..... | ..... | ..... | ..... | ..... | ..... |
| Indians | ..... | ..... | ..... | ..... | ..... | ..... |
| Totals | 47 | ..... | 25 | ..... | 72 | ..... |

## NORTHERN INSPECTION DISTRICT.

REPORT BY T. J. SHENTON, INSPECTOR.

### Telkwa Collieries Co., Ltd.

John J. McNeil, President, Telkwa, B.C.; George Woodland, Vice-President, Prince Rupert, B.C.; Thomas McClymont, Secretary-Treasurer, Prince Rupert, B.C.; Asa Robinson, Superintendent, Telkwa, B.C.

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GOAT CREEK.

J. McNeil, Managing Director; A. Robinson, Mine Foreman.

Recommencement of the mine began early in the month of August and the mine worked continuously until the end of the year.

The operation is progressive in character, disclosing evidence of a considerable coalfield; small dislocations are encountered, but the continuity of the vein is not interfered with. The coal produced has been chiefly taken out of adit and crosscuts driven in blocking out the seam, giving an increased reserve of coal. Gas has not so far been discovered. Ventilation is fair, timbering good, and all other matters of operation I have found in my inspections to be in reasonable compliance with the "Coal-mines Regulation Act."

The following are the official returns from the Telkwa Colliery for the year ended December 31st, 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 1,671 | ..... | ..... | ..... |
| Sold for export to United States | ..... | ..... | ..... | ..... |
| Sold for export to other countries | ..... | ..... | ..... | ..... |
| Total sales | ..... | 1,671 | ..... | ..... |
| Used in making coke | ..... | ..... | ..... | ..... |
| Used under colliery boilers, etc. | ..... | ..... | ..... | ..... |
| Total for colliery use | ..... | ..... | ..... | ..... |
| Stocks on hand first of year | ..... | ..... | ..... | ..... |
| Stocks on hand last of year | ..... | ..... | ..... | ..... |
| Difference added to (or taken from) stock during year | ..... | ..... | ..... | ..... |
| Output of colliery for year | ..... | 1,671 | ..... | ..... |

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

| Character of Labour. | Underground. | | Above Ground. | | Totals. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| | | $ | | $ | | $ |
| Supervision and clerical assistance | ------ | ---------- | ------ | ---------- | ------ | ---------- |
| Whites— | | | | | | |
| Miners | 5 | 4.00 | ------ | ---------- | 5 | 4.00 |
| Miners' helpers | 2 | 3.00 | ------ | ---------- | 2 | 3.00 |
| Labourers | ------ | ---------- | ------ | ---------- | ------ | ---------- |
| Mechanics and skilled labour | ---- | ---------- | 1 | 4.00 | 1 | 4.00 |
| Cook (labourer) | ------ | ---------- | 1 | 3.00 | 1 | 3.00 |
| Japanese | ------ | ---------- | ------ | ---------- | ------ | ---------- |
| Chinese | ------ | ---------- | ------ | ---------- | ------ | ---------- |
| Indians | ------ | ---------- | ------ | ---------- | ------ | ---------- |
| Totals | 7 | ---------- | 2 | ---------- | 9 | ---------- |

## Canadian National Anthracite Syndicate.

Francis Glover, Manager, Telkwa, B.C.

### SEATON MINE.

The prospecting for coal and operation began under this company at Seaton on August 25th, 1927, and closed temporarily on December 29th. An average of four men was employed.

The coal was extracted from two different veins, No. 1 seam being about 5 feet thick and No. 2 seam 3 feet. Timbering and ventilation was fair and no gas was discovered.

The following are the official returns of the Seaton mine for the year ended December 31st, 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 20 | ---------- | ---------- | ---------- |
| Sold for export to United States | ---------- | ---------- | ---------- | ---------- |
| Sold for export to other countries | ---------- | ---------- | ---------- | ---------- |
| Total sales | ---------- | 20 | ---------- | ---------- |
| Used in making coke | ---------- | ---------- | ---------- | ---------- |
| Used under colliery boilers, etc. | ---------- | ---------- | ---------- | ---------- |
| Total for colliery use | ---------- | ---------- | ---------- | ---------- |
| Stocks on hand first of year | ---------- | ---------- | ---------- | ---------- |
| Stocks on hand last of year | ---------- | ---------- | ---------- | ---------- |
| Difference added to (or taken from) stock during year | ---------- | ---------- | ---------- | ---------- |
| Output of colliery for year | ---------- | 20 | ---------- | ---------- |

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

| Character of Labour. | UNDERGROUND. | | ABOVE GROUND. | | TOTALS. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| Supervision and clerical assistance | ..... | ..... | ..... | ..... | ..... | ..... |
| Whites— | | | | | | |
| Miners | 4 | ..... | ..... | ..... | ..... | ..... |
| Miners' helpers | ..... | ..... | ..... | ..... | ..... | ..... |
| Labourers | ..... | ..... | ..... | ..... | ..... | ..... |
| Mechanics and skilled labour | ..... | ..... | ..... | ..... | ..... | ..... |
| Boys | ..... | ..... | ..... | ..... | ..... | ..... |
| Japanese | ..... | ..... | ..... | ..... | ..... | ..... |
| Chinese | ..... | ..... | ..... | ..... | ..... | ..... |
| Indians | ..... | ..... | ..... | ..... | ..... | ..... |
| Totals | 4 | ..... | ..... | ..... | ..... | ..... |

## NICOLA-PRINCETON INSPECTION DISTRICT.

REPORT BY JOHN G. BIGGS, INSPECTOR.

I have the honour to herewith submit my annual report as Inspector of Mines for the Nicola-Princeton District for the year ended 1927.

The coal-mining companies operating in the district during the past year were: The Coalmont Collieries, Limited; Middlesboro Collieries, Limited; Tulameen Valley Coal Company; Southern Okanagan Coal Company, Limited; Lynden Coal Company, Limited; and the Keystone Coal Company; the latter ceasing operations early in January.

The Lynden Coal Company, Limited, is a Bellingham syndicate incorporated during the present year for the purpose of taking over and operating the Hartman and several other coal leases adjoining, situated on the Lamont Creek (9-Mile) section of the Princeton District. An aggressive policy of construction was followed during the latter part of the year, resulting in grading 1 mile of road along the left bank of the creek from the Whipsaw Creek bridge on the Hope–Princeton highway to the coal-showings. The first truck-load of coal was brought to the railway on October 24th.

It is gratifying to report that the operating mines in this district have been very free from explosive gas during the year and I have not, during my inspections, been able to find any trace of methane at the various operations. However, the same cannot be said in regard to spontaneous heating, for it is one of the greatest sources of trouble encountered in operating coal-mines in this district, and there can be no question that the various officials should be at all times on the alert to guard against this most serious source of danger and expense. The coal-seams are generally thick and contain high volatile coals, and as a rule these coals found in the tertiary beds are ready at all times to stimulate heating, with the result that coal-mining in this district cannot and never will be a success unless the officials in charge of the operations keep this matter in mind while making their plans.

Spontaneous heating follows natural laws and we know of no method to prevent oxidation, but we can arrange the underground operations, to a great extent, to permit of the areas affected being sealed off. We have had several cases where heating occurred during the year, but fortunately we have been able to deal successfully with these.

A fire commenced in the gobs of an old pillar section of the No. 4 East mine of the Middlesboro Collieries, Limited, during the early part of the year; however, preparation had been made some time previously to guard against just such an occurrence, with the result that this small section of the mine was very quickly sealed off and has caused no further trouble. On December 5th a fire was discovered in an old caved crosscut off the No. 4 West level, No. 4 mine, of the Coalmont Collieries, Limited, which at first appeared to be a very serious matter; fortunately the compressed-air lines were a short distance away from the seat of this trouble and were quickly converted into a water-line with hose connections, and the men, with the assistance of

mine-rescue apparatus, were able to quickly control the fire. The seam at the Coalmont mines is of unusual thickness and this crosscut had caved to a height of from 10 to 12 feet, all in coal, above the timbers.

I feel that I cannot allow this occasion to pass without expressing the feelings of appreciation of parties interested in the operation of mines in this district to the Hon. the Minister of Mines, who during the present year has greatly augmented the equipment at the mine-rescue station of this district, where the apparatus of this department is at all times kept in perfect condition under the able supervision of Mr. Stone, Instructor, and is at all times ready for any emergency. I refer to the installation of six Burrell all-service gas-masks, accompanied by an ample amount of the necessary supplies, which are further supplemented by a number of the small self-rescuers. The great feature of this apparatus is its adaptability for many uses around the mines, being light, not cumbersome, and easily applied for use. This apparatus is much appreciated by the mining fraternity, especially in the protection afforded men who are required to deal with underground emergencies.

Inspection on behalf of workmen, as provided for by General Rule 37, was taken advantage of by the workmen at the various mines during 1927 and found to be a great help in assisting to maintain safe conditions, and the miners are thanked for giving their attention to this important matter.

Six accidents were reported during 1927 as required by section 71 of the "Coal-mines Regulation Act." These resulted in serious injury to five employees and one which was fatal. They occurred at the underground operations of the No. 4 mine of the Coalmont Collieries, Limited.

William James, a miner, was fatally injured in his working-place by a fall of coal. This is the first fatal accident that has occurred in any of the coal-mines in this district since the year 1922 and the first at the Coalmont Collieries, Limited, since this company commenced operations, which was about the year 1917.

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## Middlesboro Collieries, Ltd.

E. W. Humber, President, Vancouver, B.C.; C. S. Raphael, Vice-President, Vancouver, B.C.; Thos. Sanderson, Secretary, Vancouver, B.C.; C. M. O'Brian, Treasurer, Vancouver, B.C.; Robt. Fairfoull, Superintendent, Merritt, B.C.

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### MIDDLESBORO COLLIERY.

Robert Fairfoull, Manager.

This colliery is situated about 1 mile south of Merritt and is connected with the Kettle Valley Railway by a branch line to the tipple plant. It is the only company at present in operation in the Nicola coalfield. The whole of the surface plant, including the tipple, is situated at the foot of the hill south of Merritt in the valley, while the underground workings are in the side of the hill at a higher elevation. The measures have a general pitch south-east towards the valley, which forms the centre of the coal-basin. The strata lie at a high angle of inclination, with most of the coal-seams coming to the surface near the side of the hill.

During the last two years work has been gradually curtailed on the northern portion of this property, where operations were fast coming to a close, and what remained was subject to a great deal of faulting and folding. This was affecting the grade of coal considerably, so that for some time work has been concentrated on the south-east portion towards the Coldwater river, where the measures are found to be more conformable and regular and the coal of a much better quality. By the installation of mining-machines this company is at present making a product that is very satisfactory in the market.

At the present there are four workings, known as No. 2 East, No. 4 East, No. 2 North, and No. 3 North mines. No. 2 North mine is in the early stages of development and this and No. 3

North mine are by far the largest and contain the most important developments. These workings are in the upper series of the Nicola coal-basin, with the coal-seams averaging about 6 feet in thickness and overlaid by a fairly good shale roof.

*Power Plant.*—There have been no changes made in the mine power plant or the tipple during 1927. The plant consists of four return-tubular boilers having an aggregate capacity of 600 horse-power, and is chiefly used for driving a 2,300-volt alternator direct-coupled to a high-speed compound engine and also for providing power at the pump-station at the river as well as for lighting purposes. No. 4 East mine-hoist and mine-fan are operated by steam. A large steam-driven Canadian Rand 2-stage cross-compound air-compressor having a capacity of 2,000 feet of free air a minute provides power for the No. 2 and No. 3 North mines. This is at present the only power in use at these mines and, through a 3,000-foot pipe-line, operates five Siskol coal-cutting machines, mine-hoists, and slope-pumps.

Copies of the "Coal-mines Regulation Act" and the special rules are well posted at these mines.

### No. 2 North Mine.

James Fairfoull, Overman; William Adamson, Fireboss.

This mine is situated 2,000 feet south of the entrance to No. 4 East mine and at a much higher elevation. It has been developed by a main haulage-level entering the side of the hill at the surface outcropping, the seam being found in the form of a basin, with a general pitch east of 60° near the surface croppings and gradually falling off towards the centre of the basin. It has an average thickness of 6 feet, with the same characteristics as the old No. 2 seam. From the main adit-level headings have been driven to the croppings at the top of the hill, and a slope driven to the dip a distance of 700 feet near the entrance to the main adit-level and the whole of the mine blocked out into pillars, with the result that for some time most of the work done in this mine has been the extraction of these pillars.

At the foot of the slope a large upthrow fault was encountered, with the result that a rock tunnel was continued through this fault, and at present has reached a distance of about 100 feet, for the purpose of proving the extension of No. 2 seam. The life of this mine depends to a great extent upon the results of this work.

The mine is somewhat shallow and ventilation is produced naturally by five separate openings to the surface, and where the pillars are being drawn there are several "breaks" to the surface, and naturally the quantity of air passing into this mine depends to a great extent upon the surface temperature. During my last inspection ventilation measured showed that 20,000 cubic feet of air a minute was passing into this mine for the use of thirty-two men and one horse. No trace of gas has been found in this mine, the air being well conducted around the working-faces, while the brattice and stoppings were in good order. The working-places and roads were well timbered and in good condition.

### No. 3 North Mine.

Andrew McKendrick, Overman; Matthew McKibben and William Ewart, Firebosses.

This mine has been developed by a main level driven into the side of the hill from the surface croppings, is on the same elevation, and about 150 feet back from the entrance to No. 2 North mine, where the measures are found to have the same conformation and direction of dip as in No. 2 mine; the method of work adopted therefore follows very much in line with the mine. As, however, the seams lie at an angle of inclination, while No. 3 lies much lower in the measures, No. 3 seam covers a much larger area in this coal-basin and is at present the largest producing mine at this colliery.

The main adit-level, used for haulage, has reached a distance of 2,000 feet from the portal and headings have been driven towards the surface croppings at the top of the hill. This is reached at about 400 feet, where the pillars are at present being drawn. Near the portal of the Main level an 18° slope has been driven in the coal a distance of 400 feet to the dip, from which slope levels have been driven and the mine blocked out into pillars by levels and crosscuts having a width of 12 feet. Owing to the high inclination of the seam all the coal is conveyed from the faces of the headings and crosscuts by means of chutes, where it is loaded into the mine-cars on the levels and hauled out of the levels by horses, and from the slope by means of a compressed-

air hoist situated near the entrance to the mine, to a large siding where the cars of Nos. 2 and 3 mines are collected and lowered over a 3,000-foot surface incline by a large compressed-air hoist in the mine-yard. Ventilation is at present natural and during my last visit of inspection I found 20,000 cubic feet of air a minute passing into this mine for the use of thirty-five men and two horses. Barometer, 28 inches; thermometer, zero. The air was well conducted around the working-faces and the brattice and stoppings in good order. The working-places were well timbered and a sufficient supply of suitable timber was provided for the use of the miners. The roads were well timbered and in fairly good condition.

The working-places of No. 2 and No. 3 North mines are all machine-mined by the post-puncher type of machine, and owing to the high inclination of the seam and the friable nature of the coal require to be well spragged during the cutting operations. Little blasting is used and the object of using machines is to get the coal as large and as clean as possible. Permitted explosives are used and all shots fired by certificated officials appointed for this purpose. Edison head-lights are in use by all the employees underground and Wolf safety-lamps are used by officials for inspection purposes.

Samples of material have been taken from the roads of the mines during each month pursuant to the provisions of section 128, "Coal-mines Regulation Act," for analyses, and in almost all cases the percentage of non-combustible matter has been in keeping with the requirements of the dust regulations. The mine committee has made the usual inspection of these mines, as required by General Rule 37, during each month and the reports in each case have been favourable.

### No. 2 East Mine.

A. D. Allen, Overman.

No. 2 East is a small mine opened for the surface outcropping on the north side of the surface incline from the mine-yard to No. 2 and No. 3 North mines, in a thick seam of coal found lying at a high angle, and is developed by a 10° slope following the direction of the seam. It is more or less in the prospecting stage and has not been correlated with the other seams of coal found on this property.

From the foot of the slope a raise has been driven to the surface. This greatly improves the ventilation, which is at present produced naturally for the use of thirteen men. The mine is free from any trace of methane and the roads well timbered and in good condition. The working-places are well timbered and a sufficient supply of suitable timber is provided for the use of the workmen.

The coal is mined by machines of the post-puncher type and as a result little blasting is required. General conditions in this mine were found to be good.

### No. 4 East Mine.

A. D. Allen, Overman; Thomas Rowbottom, Fireboss.

This is the oldest operating mine of the Middlesboro Collieries and is situated a short distance south of and on the same elevation as the surface tipple and has been developed from the croppings by a 15° main slope. It is in No. 4 seam of this property, which seam is found to have an average thickness of 10 feet in this portion of the mine.

The mine is fast drawing to a close as the area is very limited. The work at present consists of the extraction of pillars close to the Main slope, above the old No. 2 level, which level is situated about 300 feet from the portal.

Ventilation is produced by a small belt-driven double-inlet fan and during my last inspection ventilation measured showed that 8,000 cubic feet of air a minute was passing into this mine for the use of eleven men. The air was well conducted around the working-faces and the brattice and stoppings were in good order. The working-places were well timbered and a sufficient supply of suitable timber was provided for the use of the miners. The roads were well timbered and in fairly good condition and, being naturally damp, were free from dangerous coal-dust.

The method of haulage is very simple, the coal being trammed in 1½-ton cars from the faces to the Main slope and hoisted to the surface by a steam-hoist situated near the entrance to the mine.

The following are the official returns for the Middlesboro Colliery for the year ended December 31st, 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 40,970 | | | |
| Sold for export to United States | | | | |
| Sold for export to other countries | | | | |
| Total sales | | 40,970 | | |
| Used in making coke | | | | |
| Used under colliery boilers, etc | 2,037 | | | |
| Total for colliery use | | 2,037 | | |
| | | 43,007 | | |
| Stocks on hand first of year | 241 | | | |
| Stocks on hand last of year | 179 | | | |
| Difference taken from stock during year | | 62 | | |
| Output of colliery for year | | 42,945 | | |

Number of Hands employed, Daily Wages paid, etc.

| Character of Labour. | Underground. | | Above Ground. | | Totals. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| | | $ | | $ | | |
| Supervision and clerical assistance | 7 | | 3 | | 10 | |
| Whites— | | | | | | |
| Miners | 40 | 4.50 | | | 40 | |
| Miners' helpers | 16 | 4.00 | | | 16 | |
| Labourers | 20 | 4.00–4.50 | 12 | 4.20 | 32 | |
| Mechanics and skilled labour | | | 12 | 4.40–5.30 | 12 | |
| Boys | | | 5 | 2.50 | 5 | |
| Japanese | | | | | | |
| Chinese | | | | | | |
| Indians | | | | | | |
| Totals | 83 | | 32 | | 115 | |

## Keystone Coal Co., Ltd.

John T. Brown, Overman; Richard Dunnigan, Fireboss.

This company was organized in 1923 for the purpose of taking an option on and operating the coal property of the Fleming Coal Company, which is situated near the apex of the hill, about 2 miles west of Merritt, and in the north-west section of the Nicola coal-basin.

The available coal in the seams exposed on this property has been exhausted and the mine was closed on January 6th, 1927.

## Coalmont Collieries, Ltd.

W. J. Blake Wilson, President, Vancouver, B.C.; General J. W. Stewart, Vice-President, Vancouver, B.C.; A. H. Douglas, Secretary, Vancouver, B.C.; D. McLeod, Treasurer, Vancouver, B.C.; Geo. Murray, Superintendent, Blakeburn, B.C.

## COALMONT COLLIERY.

Geo. Murray, Manager.

This colliery is situated 4 miles from Coalmont, on the main line of the Kettle Valley Railway, 170 miles east of Vancouver and 12 miles west of Princeton. The main power plant, mine screens, and tipple are located at Coalmont and connected with the colliery situated on the North fork of Granite creek at an elevation of 3,600 feet (1,600 feet above the plant) by a high-tension electric line and an overhead tramway approximately 2½ miles in length.

The present workings are the Nos. 3 and 4 mines in the same seam of coal which is found to be outcropping at the side of the mountain; the mines, however, are two entirely separate operations on account of a large intrusive dyke which cuts across the field north and south. The entrance to No. 3 is at the same elevation and in close proximity to the upper terminal of the overhead tramway, while the entrance to No. 4 is 5,400 feet west of the entrance to No. 3 and is connected to the surface tramway by a light railway running along the side of the mountain. This mine is in a coal-basin on west side of the intrusive dyke and contains the largest and the most important workings, with the lower levels of the mine heading in the direction of the Tulameen section of the coalfield, which by surface indications appear to be promising and to contain the most important coal-deposits of this field.

The largest and most important work executed at this colliery during 1927 was the completion of a 1,600-foot rock tunnel at No. 4 during the month of September. This was driven into the side of the mountain near the foot of the surface incline to facilitate haulage by eliminating the upper section of the mine to the No. 6 level, a vertical distance of some 200 feet. This reduces the slope-haulage 600 feet, thereby greatly simplifying the haulage system, as the new rock tunnel may be considered as an extension of the present light railway connecting this mine with the mine-yard and the tramway.

*Power Plant.*—The main power plant is situated near the tipple of the town of Coalmont and consists of three 250-horse-power cross-drum horizontal-inclined water-tube boilers, which are arranged so as to permit operation under forced draught if required. The boilers are provided with duplicate feed-pumps and feed-water heaters and are used for operating two power units, a 600-horse-power Corliss cross-compound condensing-engine coupled direct to a G.E. 3-phase alternator, with a tension of 500 volts and a speed of 500 revolutions a minute. A new unit installed during 1926 consists of a 500-kw. Westinghouse-Parsons steam-turbine generator; these two units feeding into one set of transformers near the plant, where the voltage is stepped up to 10,000 volts and carried over high-tension wires to transformers at the mine, where the voltage is reduced to 550 for power and 110 volts for lighting. The power is used in the two mine-fans, two air-compressors, motor generating-set, tramway motor, and 250-horse-power hoist at No. 4.

This plant is supplemented by a small steam plant at the mine, consisting of two Jenks return-tubular boilers, used for operating a steam-driven air-compressor providing power for No. 4 mine hoist, the mine-pumps, and for heating the dining-room, large rooming-house, wash-house, machine-shop, and office buildings.

During the present year the small-gauge steam-locomotive used between No. 4 and the overhead tramway has been replaced by a 6-ton trolley motor, which appears to be much more satisfactory for this class of work.

*Aerial Tramway.*—Owing to the topography and the elevation of the mine above the railway an aerial tramway system of haulage was adopted for conveying the coal from the mines to the tipple, which was fairly successful. While this method of transportation has been in use at several of the metalliferous mines in this Province, it may be considered somewhat unusual at a large coal-mine. The most unfavourable feature of the tramway at Coalmont is that the capacity of the mines is limited to the capacity of the tramway, and any delay during the shift, owing to failure of machinery or accident in the haulage system, is not as a rule recoverable and makes it a very hard matter to maintain a regular production during each day.

The tramway is about 2½ miles in length, has a difference of 1,600 feet in elevation, and is equipped with 1-ton buckets and carrier and traction cables. The buckets, which constitute the body of the mine-car, are lifted from the mine-car frame at the upper terminal, by means of carrier-arms operated by compressed-air lifts, to an overhead rail connected to the carrier-cable, where the buckets are properly spaced and attached to the travelling-cable by means of

"grips." The buckets are supported on the empty side of the tramway by 1⅛-inch locked coil cable and on the full side by a 1⅝-inch track strand smooth coil cable, each of which are provided with tensions and controlled by a 50-horse-power constant-speed motor connected by gearing to a "Fowler Grip" pulley and friction-brake operated by levers from the control-house at the upper terminal. This tramway has a capacity of one bucket a minute or 60 tons of coal an hour.

### No. 3 Mine.

Harry Hopkins, John Gillham, and Robert Barrass, Firebosses.

The entrance to this mine is situated a short distance west of the mine-yard, at the same elevation as the upper terminal of the overhead tramway, and is developed by a well-timbered 8- by 12-foot tunnel, generally termed the "Wilson tunnel." This follows the strike of the seam from the surface croppings a distance of 1,600 feet to the top of No. 2 slope and separated from the old No. 2 mine, which was operated in the same seam, by a barrier-pillar 100 feet in width. All the workings in the No. 3 are to the dip of the Main level from No. 2 slope, where the pillars are being drawn.

In March, 1925, a most unfortunate fire occurred in this mine and to control the same it was necessary to erect seals on the main levels and close the mine down. The principal work done during 1927 has been the dewatering of the lower section of this mine lying to the dip of the Main level, cleaning out and retimbering No. 2 slope, which is to be used as the main haulage, driving a counter for purposes of ventilation, and sealing off all the old crosscuts as the water recedes.

The seams of coal at the Coalmont Collieries are of unusual thickness and as a result the caves in the old disused roads and gobs are loaded with this highly volatile material, making them very susceptible to spontaneous combustion. Mines of this description require careful supervision and attention to guard against such combustion. No. 2 slope has been cleaned and retimbered for about 1,000 feet, and preparation has been about completed for the commencement of the extraction of the lower pillars, which should be drawn back with as little delay as possible and the gibs behind allowed to fill with water.

The coal being rather friable is mined by hand and little blasting is required. All shots are fired under the supervision of certificated officials appointed for this purpose. Ventilation is produced by a 5-foot "booster" fan situated near the entrance of the fan-drift, belt-driven by a 30-horse-power induction-motor, and during my last visit ventilation measured showed 19,800 cubic feet of air a minute passing into this mine for the use of fifteen men; barometer, 26 inches; thermometer, 42° F. The air was being well conducted around the working-faces and I found the mine seals and brattice in good order.

The working-places were well timbered and a sufficient supply of suitable timber was provided for the use of the miners. The roads were well timbered and in fairly good condition. During the present year I have not been able to find any trace of methane in this mine. Owing to the pitch of the seam the coal is loaded into chutes at the working-faces of the headings and crosscuts and loaded into the mine-cars on the levels. The roads of this mine, being naturally damp, are free from dangerous coal-dust.

### No. 4 Mine.

James Webster, Overman; Frank Bond, Robert Murray, John Malone, James Simm, Thomas Dobie, Peter Hunter, George Walker, and James McWhirter, Firebosses.

This mine is the principal working of the Coalmont Collieries. It is situated 5,400 feet west of the entrance to No. 3 mine and develops the same seam of coal on the west side of the "Duke" which was found outcropping at the surface on the mountain-side. The mine is now entered by a 7- by 10-foot rock tunnel 1,600 feet in length, completed during the latter part of 1927 to improve the haulage by cutting off the upper section of this mine, and intersects the Main slope at No. 6 level.

No. 4 mine has been developed by an 18° slope which at the present time has been driven 2,400 feet from the upper rock tunnel. The usual pillar system method by a series of levels driven from the Main slope as same advanced is used, No. 17 level being the lower on the East side, while No. 15 is the lower on the West side. The area of the mine is somewhat limited on the East side owing to a large intrusion which heads at a small angle towards the slope, with the result that there has been a considerable amount of pillar-drawing on the East side in the

upper levels during 1927, while the chief developments are being carried out on the West side of this mine from the Nos. 12 and 15 West levels. These latter are being driven for the purpose of opening a new section of this coalfield lying to the west, where surface indications appear most favourable. The seam of coal worked is the third in the series and has an average thickness of 10 to 12 feet and the whole may be generally considered as one large seam of coal having an aggregate thickness of some 160 feet, containing small bands of shale, bone, and fireclay. The ground is subject to a great deal of minor faulting and crushed zones and requires very heavy timbering not only at the working-faces, but on the roadways. Owing to the pitch of the seam, which averages about 30°, the coal is transferred from the faces of the crosscuts and the skips in pillar-drawing to the levels by means of chutes, loaded into the mine-cars, and hauled by horse to landings situated near the Main haulage-slope and hauled out of the slope in five-car trips by main-rope haulage to a large siding on the inside of the new rock tunnel, where the cars are collected into large trips and drawn to the upper terminal of the overhead tramway by motors.

Ventilation is produced by an 84-inch double-inlet belt-driven Sirocco reversible fan operated by a 75-horse-power constant-speed alternator situated near the entrance to the counter-heading. During my last inspection ventilation as measured showed 50,000 cubic feet of air a minute passing into this mine, divided into two splits. The East side split was found to be passing 20,000 cubic feet of air a minute for the use of thirty-two men, while the West side split was found to be passing 30,000 cubic feet of air a minute for the use of forty men. The brattice and stoppings were in fairly good order and the air well conducted to the working-faces, while no trace of methane has been at present found in this mine.

The working-places are well timbered and a sufficient supply of suitable timber was provided for the use of the workmen. The roads were well timbered and in fairly good condition; the levels of the mine are generally quite wet, while a spraying system of water has been adopted on the Main slope, causing this mine to be very free from the presence of dangerous coal-dust.

A well-appointed doctor's office and first-aid room, which is steam-heated and provided with hot and cold water, is maintained at this mine under the supervision of a first-aid man, who is at all times in attendance to render any services that may be required, while a doctor pays a visit to the mine each day. The mine-rescue station, provided with a smoke-room under the same roof as the doctor's office, is well equipped by five sets of Gibbs self-contained breathing apparatus, pulmotor, charging-pump, and also a good supply of oxygen and regenerators, and is at all times ready for use in any emergency.

All blasting in the mine is done under the supervision of certificated officials by the use of permitted explosives. Edison electric head-lights are in use by all the employees underground, while Wolf safety-lamps are in use by the officials for purposes of inspection.

Copies of the "Coal-mines Regulation Act" and special rules are well posted at these mines.

The following are the official returns for the Coalmont Colliery for the year ended December 31st, 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 141,402 | | | |
| Sold for export to United States | | | | |
| Sold for export to other countries | | | | |
| Total sales | | 141,402 | | |
| Used in making coke | | | | |
| Used under colliery boilers, etc. | 11,193 | | | |
| Total for colliery use | | 11,193 | | |
| | | 152,595 | | |
| Stocks on hand first of year | | | | |
| Stocks on hand last of year | | | | |
| Difference added to (or taken from) stock during year | | | | |
| Output of colliery for year | | 152,595 | | |

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

| Character of Labour. | Underground. | | Above Ground. | | Totals. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| | | $ | | $ | | $ |
| Supervision and clerical assistance | 14 | 6.43 | 13 | 6.00 | 27 | 6.22 |
| Whites— | | | | | | |
| Miners | 147 | 7.27 | ..... | ..... | 147 | 7.27 |
| Miners' helpers | ..... | ..... | ..... | ..... | ..... | ..... |
| Labourers | 62 | 4.69 | 76 | 4.33 | 138 | 4.49 |
| Mechanics and skilled labour | 1 | 5.77 | 31 | 5.18 | 32 | 5.20 |
| Boys | 3 | 3.58 | 2 | 3.50 | 5 | 3.55 |
| Japanese | ..... | ..... | ..... | ..... | ..... | ..... |
| Chinese | ..... | ..... | 1 | 2.64 | 1 | 2.64 |
| Indians | ..... | ..... | ..... | ..... | ..... | ..... |
| Totals | 277 | ..... | 123 | ..... | 350 | ..... |

## Tulameen Valley Coal Co.

### No. 1 MINE.

Charles A. Hunter, General Superintendent; David Francis, Overman.

This mine is situated about 2 miles west of Princeton, reached by a wagon-road on the left bank of the Tulameen river. It has been developed by three adit-levels entering the side of the hill, at different elevations, from the surface croppings. The two lower adits entered a faulted and troubled zone about 1,300 feet from the entrance, while the headings driven to the raise of these levels came in contact with the alluvials, and as a result one would naturally infer that this is the limit of the operations on the raise side of this mine. During 1927 the principal work has been to the dip of the Main level from a 10° slope commenced about 700 feet from the entrance to the mine. During my last visit of inspection this slope had been driven a distance of 400 feet, at which point the coal is found to maintain its usual good quality. From here the seam is being blocked out into pillars, with the rooms and the levels about 12 feet in width. However, it would appear that with depth this seam is taking on a greater inclination.

This seam has an average thickness of about 24 feet and has the same characteristics as No. 1 seam of the Princeton-B.C. Collieries, Limited, the lower portion of which is intersected with bands of bone and fireclay, with the result that the workings are confined to the upper 8 to 10 feet (overlaid by a fairly good shale roof), which is practically clean coal and is in good demand in the domestic market.

Ventilation is produced by a 5-foot enclosed-type mine-fan, belt-driven by a gas-engine situated near the entrance to the upper level. During my last inspection ventilation measured showed that 6,000 cubic feet of air a minute was passing into this mine for the use of nineteen men. The air was well conducted around the working-places, while the brattice and stoppings were in fairly good order, and until the present no trace of methane had been found in this mine. The working-places are well timbered by framed sets and suitable timber was provided for this purpose. The roads are well timbered, in fairly good condition, and, being naturally wet, are free from dangerous coal-dust.

Owing to the inclination of the seam the coal is conveyed from the face of the headings and crosscuts by means of chutes to the main levels, where it is loaded into the 1-ton mine-cars. These are trammed by hand to landings situated on the levels near the slope and hoisted in two-car trips to the Main haulage-level by a small compressed-air hoist. They are then drawn from the mine by horse and dumped over a bar-screen arrangement, the lower portion of which is used as a bunker. The coal is loaded on motor-trucks and hauled a distance of about half a mile to a loading-platform situated on a spur off the main line of the Kettle Valley Railway near the entrance to the Princeton Railway tunnel.

As the present workings are all being conducted to the dip of the Main level, it was found necessary to install a steam plant. This is situated near the entrance to the mine and consists of a 60-horse-power locomotive-type steam-boiler and is at present being used for the operation of a 14 by 12 Ingersoll-Rand single-stage air-compressor, belt-driven by a 14 by 20 horizontal single-cylinder steam-engine. This power is conducted into the mine by means of a compressed-air line and is used for the operation of the mine-hoist, slope-pump, and the coal-cutting machines.

The coal at the faces is all mined by coal-cutting machines of the post-puncher type and the use of explosives is avoided as much as possible. Approved Wheat electric head-lights are in use by the employees underground, while Wolf safety-lamps are used by the officials for inspection purposes.

Copies of the "Coal-mines Regulation Act" and special rules are well posted at this mine.

The following are the official returns for the Tulameen Valley mine for the year ended December 31st, 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 13,677 | ..... | ..... | ..... |
| Sold for export to United States | ..... | ..... | ..... | ..... |
| Sold for export to other countries | ..... | ..... | ..... | ..... |
| Total sales | ..... | 13,677 | ..... | ..... |
| Used in making coke | ..... | ..... | ..... | ..... |
| Used under colliery boilers, etc. | 713 | ..... | ..... | ..... |
| Total for colliery use | ..... | 713 | ..... | ..... |
| | | 14,390 | | |
| Stocks on hand first of year | ..... | ..... | ..... | ..... |
| Stocks on hand last of year | 16 | ..... | ..... | ..... |
| Difference added to stock during year | ..... | 16 | ..... | ..... |
| Output of colliery for year | ..... | 14,406 | ..... | ..... |

Number of Hands employed, Daily Wages paid, etc.

| Character of Labour. | Underground. | | Above Ground. | | Totals. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| | | $ | | $ | | $ |
| Supervision and clerical assistance | 1 | 7.00 | 4 | 6.50 | 5 | 6.60 |
| Whites— | | | | | | |
| Miners | 7 | 6.00 | ..... | ..... | 7 | 6.00 |
| Miners' helpers | 7 | 4.50 | ..... | ..... | 7 | 4.50 |
| Labourers | 5 | 4.50 | 10 | 4.25 | 15 | 4.33 |
| Mechanics and skilled labour | 2 | 9.00 | 4 | 5.00 | 6 | 6.33 |
| Boys | ..... | ..... | 2 | 2.75 | 2 | 2.75 |
| Japanese | ..... | ..... | ..... | ..... | ..... | ..... |
| Indians | ..... | ..... | ..... | ..... | ..... | ..... |
| Chinese | ..... | ..... | ..... | ..... | ..... | ..... |
| Totals | 22 | ..... | 20 | ..... | 42 | ..... |

## Lynden Coal Co., Ltd.

M. C. DuVall, President, Bellingham, Wash.; P. V. Avery, Vice-President, Everson, Wash.; F. P. Cruickshank, Secretary, Lynden, Wash.; J. P. Vanhenart, Treasurer, Lynden, Wash.; W. R. Foster, Superintendent, Princeton, B.C.

### No. 1 MINE.

William Foster, Manager; Frank Lester, Robert Gourley, and Wm. Harmison, Firebosses.

This company commenced operations at a coal property situated on Lamont (9-Mile) creek in the Princeton district during the latter part of 1927. Here a large seam of coal having a thickness of 16 feet, pitching into the side of the hill at an angle of 12°, was to be seen outcropping on the left bank of the creek about a mile above the main road, the upper section of the seam being practically clean coal and overlaid by a fairly strong shale roof.

This mine has been developed from the croppings by a 10° 10- by 12-foot well-timbered haulage-slope. During my last visit of inspection this slope had reached a distance of 300 feet from the portal, with two levels driven off to the right, while from the upper level a back crosscut was being driven towards the surface cropping, and will constitute a back slope which will be used for ventilation purposes, all work being done in the upper 8-foot section of the seam. The working-places are all mined by machines of the post-puncher type and the use of explosives is reduced as much as possible. This coal commands a good market for domestic purposes and the use of the mining-machines is for the elimination of slack as much as possible and to provide a good grade of coal for this market.

During my last inspection I found thirty-seven men employed in and about the mine, eighteen of whom were employed underground, the mine being worked on three shifts. At the surface nineteen men were employed, chiefly in construction-work. The mine was well timbered with heavy framed sets, and fortunately for the company there appears to be a large amount of suitable mine-timber available on the property. The ventilation was fairly good, the roads damp, and no trace of methane was found. A steam power plant has been installed and the coal is hoisted from the mine by a steam-driven mine-hoist in cars having a capacity of about 1 ton.

The power plant consists of a 16- by 5½-foot return-tubular boiler situated near the entrance to the mine and is capable of producing 180 horse-power. This is used for providing power for a single-stage air-compressor having a capacity of 516 cubic feet of free air a minute; also a 7- by 12-foot double-cylinder steam-hoist for hauling cars from the Main slope to the mine-yard. I am very pleased to state that an enclosed type mine-fan direct-coupled to a small high-speed Sturtevant engine is at present on the ground and is capable, I am advised, of producing 50,000 cubic feet of air, against a 1-inch water-gauge. This will be installed as soon as possible.

*Construction-work.*—Owing to this mine being situated about 10 miles from Princeton it was necessary to provide accommodation for the employees at the mine, and until this is completed the men are being taken to and from the mine by means of a motor-truck. A two-story 42- by 32-foot combined cook and bunk house is nearly completed. This contains eight bedrooms and a reading-room on the upper floor and five bedrooms, wash-room, kitchen, and dining-room on the lower floor. A large combined blacksmith and machine shop near the entrance to the mine will be completed early in 1928. An improvised small bar-screen has been erected a short distance from the entrance to the mine and, while somewhat crude, appears to be satisfactory for the present. From this the coal is graded and loaded into large motor-trucks and transported to a loading-platform at Princeton Railway Station. This method is being used until a suitable railway spur can be arranged for with the railway company.

I found the general conditions of the mine to be good and the provisions of the Act well adhered to; permitted explosives being used for blasting; Edison electric safety-lamps being in use by the employees underground, while Wolf safety-lamps are used by the officials for inspection purposes.

The following are the official returns from the Lynden Coal Company, Limited, for the year ended December 31st, 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 2,081 | | | |
| Sold for export to United States | 439 | | | |
| Sold for export to other countries | | | | |
| Total sales | | 2,520 | | |
| Used in making coke | | | | |
| Used under colliery boilers, etc | 250 | | | |
| Total for colliery use | | 250 | | |
| | | 2,770 | | |
| Stocks on hand first of year | | | | |
| Stocks on hand last of year | | | | |
| Difference added to (or taken from) stock during year | | | | |
| Output of colliery for year | | 2,770 | | |

Number of Hands employed, Daily Wages paid, etc.

| Character of Labour. | Underground. | | Above Ground. | | Totals. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| | | $ | | $ | | $ |
| Supervision and clerical assistance | 3 | 6.00 | 3 | 6.00 | 6 | 6.00 |
| Whites— | | | | | | |
| Miners | 14 | 6.00 | | | 14 | 6.00 |
| Miners' helpers | 2 | 5.00 | | | 2 | 5.00 |
| Labourers | | | 15 | 4.10 | 15 | 4.10 |
| Mechanics and skilled labour | | | 7 | 5.50 | 7 | 5.50 |
| Boys | | | | | | |
| Japanese | | | | | | |
| Chinese | | | | | | |
| Indians | | | | | | |
| Totals | 19 | | 25 | | 44 | |

## Southern Okanagan Collieries, Ltd.

G. R. Hookham, President, Vancouver, B.C.; C. J. Rippin, Vice-President, West Summerland, B.C.; R. Grant, Secretary-Treasurer, Vancouver, B.C.; Ben R. Barlow, Superintendent, Penticton, B.C.

Prospecting-work has been carried on in two seams on this property, No. 3 seam having a thickness of 3 feet and No. 5 seam a thickness of 2½ feet. Both seams dip to the south and pitch approximately 50°.

In the case of No. 3 seam a tunnel has been driven a distance of 580 feet on the strike of the seam and a raise connected with the surface. The work done in No. 5 seam consists of a tunnel some 285 feet long with a raise to the surface; these tunnels being practically all in coal.

A gasoline-driven compressor supplies power for any rock-drilling that may be required.

Coal Creek Rescue Team, 1927.

Cassidy Mine-rescue Team.

Coal Creek, B.C.

Coal Creek Colliery—Loading Coal.

The following are the official returns from the Southern Okanagan Company, Limited, for the year ended December 31st, 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 481 | ..... | ..... | ..... |
| Sold for export to United States | 95 | ..... | ..... | ..... |
| Sold for export to other countries | ..... | ..... | ..... | ..... |
| Total sales | ..... | 576 | ..... | ..... |
| Used in making coke | ..... | ..... | ..... | ..... |
| Used under colliery boilers, etc | ..... | ..... | ..... | ..... |
| Total for colliery use | ..... | ..... | ..... | ..... |
| Stocks on hand first of year | ..... | ..... | ..... | ..... |
| Stocks on hand last of year | ..... | ..... | ..... | ..... |
| Difference added to (or taken from) stock during year | ..... | ..... | ..... | ..... |
| **Output of colliery for year** | ..... | 576 | ..... | ..... |

Number of Hands employed, Daily Wages paid, etc.

| Character of Labour. | Underground. | | Above Ground. | | Totals. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| | | $ | | | | |
| Supervision and clerical assistance | 1 | 7.50 | ..... | ..... | ..... | ..... |
| Whites— | | | | | | |
| Miners | 2 | 5.50 | 1 | ..... | ..... | ..... |
| Miners' helpers | ..... | ..... | ..... | ..... | ..... | ..... |
| Labourers | ..... | ..... | ..... | ..... | ..... | ..... |
| Mechanics and skilled labour | ..... | ..... | ..... | ..... | ..... | ..... |
| Boys | ..... | ..... | ..... | ..... | ..... | ..... |
| Japanese | ..... | ..... | ..... | ..... | ..... | ..... |
| Chinese | ..... | ..... | ..... | ..... | ..... | ..... |
| Indians | ..... | ..... | ..... | ..... | ..... | ..... |
| Totals | 3 | ..... | 1 | ..... | ..... | ..... |

## EAST KOOTENAY INSPECTION DISTRICT.

Report by Robert Strachan, Senior Inspector.

I have the honour to submit my annual report for year 1927, covering the inspection of coal-mines in the East Kootenay District as provided for in the "Coal-mines Regulation Act."

The general inspection of the mines was made by John MacDonald, Inspector of Mines, whose report of the conditions existing in and around the mines is attached.

Only three collieries were in active operation during 1927—namely, Coal Creek, Michel, and Corbin. The first two are owned by the Crow's Nest Pass Coal Company and the latter by Corbin Coals, Limited. At Coal Creek five mines were worked—three at Michel and two at Corbin.

No labour troubles arose during 1927, but a considerable loss of working-time was incurred owing to lack of demand for coal. This was most noticeable during the summer months, work being fairly steady in the beginning and at the end of the year.

Taking the district as a whole, the mines were worked on 86 per cent. of the available working-days throughout the year, which was a considerable improvement as compared with the previous year.

### Accidents.

Eleven accidents were reported under section 71 of the "Coal-mines Regulation Act." These involved death or serious injury to twelve workmen.

Ten of these accidents came under subsection (*b*) of the Act and one under subsection (*a*), explosions of gas, powder, or steam-boiler. Six of these accidents occurred at Coal Creek Colliery, two at Michel, and three at Corbin. Eight of the accidents occurred underground, involving nine workmen, and three above ground, involving three workmen. All the accidents were investigated and where necessary suggestions made to prevent a recurrence.

Dealing with the causes of accidents, a fatal accident at Coal Creek Colliery was due to a driver riding on a loaded car, which must have struck a post, thus causing a cave of fine coal from overhead which buried the man. In this case the driver had been given instructions not to ride on the loaded car and failure to carry these out resulted in his death.

Two haulage accidents at this colliery were due, first, to a horse backing up and squeezing a man against a post, and to the second to a driver being jammed between a car and a post when the car became derailed.

Two accidents were due to falling of roof or side-coal, causing non-fatal injuries. Another accident was due to a workman, on coming off a pile of mine-timbers, stepping into deep snow, losing his balance and falling, striking a mine-track in his fall.

The only two accidents reported from Michel Colliery occurred outside the mine; one to a mechanic, who slipped while threading a pipe and fractured his leg.

The other accident was rather peculiar; a labourer had been engaged, with others, in repairing an old culvert, which had given way, the man receiving a scratch from a piece of timber. He complained of his condition and was taken to the hospital, where the doctor examined him and could find no evidence of serious injury, only a slight ruffling of the surface skin. He died four days later, and, according to the death certificate given by the doctor, death was due to "Intestinal paralysis and toxæmia." The verdict of the Coroner's jury was: "The cause of death was the intestinal paralysis caused by the injuries received at Michel Colliery." I consider it was rather unfortunate that no post-mortem or autopsy was held as the injuries received were merely superficial.

At Corbin Colliery there were two non-fatal accidents, due to workmen being squeezed between cars and posts, one outside the mine and the other inside.

The other accident at Corbin was in No. 6 mine, where an ignition of gas occurred, and this, from the evidence, most probably was caused by a badly placed shot. The method of mining in No. 6 mine is by a caving system, large areas or spaces being left where inflammable gas may collect and which it is almost impossible to examine.

The shot in this case, very probably intended to assist the breaking-down of the coal, did not have sufficient coal to resist its blowing through into the space left by the extraction of coal and where explosive gas must have been present.

Only two workmen were in the mine at the time, a fireboss and a miner; the latter drilled the holes to be fired, the former did the blasting. The force of the explosion did not travel very far owing to the damp nature of the mine and to the very small percentage of methane which is ordinarily found in the mine air-current.

The indications would show that the miner, in flying from the flame caused by the explosion, fell down a chute and was killed; the fireboss received severe burns from which he died three days later.

What really took place previous to the accident will probably never be known owing to the death of the only two men in the mine; there is very little doubt but that the cause of the accident was the force of the shot being spent in an atmosphere containing inflammable gas.

In connection with this accident, samples taken of the mine air has never exceeded 0.25 per cent. of methane, and usually runs about 0.13 per cent.

### Dangerous Occurrences.

Thirteen notices were received at this office covering occurrences under the above section. These included ten outbursts of gas (methane), generally accompanied by coal-dust, two bumps, and one ignition of gas.

The outbursts of gas all occurred in No. 1 East mine, Coal Creek Colliery, as did one of the bumps; the other bump affected the whole valley in which Coal Creek Colliery is situated, but did not noticeably affect any particular mine.

The other occurrence reported under part (*c*) was an ignition of gas in No. 6 mine, Corbin Colliery.

The extent of the outbursts of gas varied from a comparatively small amount of gas discharged, accompanied by several tons of fine dust and coal, to about 3,000,000 cubic feet of gas, with 500 tons of coal and coal-dust and about 50 tons of rock or slate.

The majority of these outbursts have occurred in the dip-workings of No. 1 East mine, forty-nine out of the last fifty reported having occurred in this district. These seem to occur in two fairly well-defined districts, and during the present year five out of the ten reported have occurred in No. 16 East slope, four in No. 10 slope, and one in No. 14 slope. They seem to be more frequent during periods of steady or continuous work.

### Ventilation.

The general conditions with respect to ventilation have been maintained fairly well during 1927 and are dealt with in detail in the attached report by John MacDonald, Inspector of Mines.

Advantage was taken, during 1927, of the facilities afforded by the Dominion Department of Mines to have analysis made of samples of the mine-air, and we are very much indebted to them for these analyses, for the sample-bottles furnished, and for mailing facilities.

During 1927 135 samples were taken and forwarded to Ottawa, of which sixteen were lost either in transit or breakage. Of the samples taken, ninety-seven were taken in Coal Creek Colliery, thirty-two in Michel, and six in Corbin. In taking samples the general conditions of the mine-air determined the number of samples.

A great deal of information is afforded by these samples, especially as they give a very accurate record of the methane contents, as well as a check on the reading given by the Burrell gas-detector.

The conditions of the air-currents have been maintained fairly good during the year with regard to the amount of methane determined by these analyses, when we consider the amount given off.

In many of the ventilation splits the amount of methane given off to the ton of coal mined is very great, and in the case of No. 1 East mine, Coal Creek Colliery, varies from 1,793 cubic feet to 4,600. In two out of five districts in the mine it runs well over the 4,000 mark. No. 3 mine, Michel Colliery, also runs very high, in one split showing over 6,000 cubic feet a ton of coal mined.

It will also be noted that, in those districts where the amount of methane given off to the ton of coal is high, the amount of air provided for each workman also runs high. In the case of the split in No. 3 mine, Michel, this runs up to almost 1,460 cubic feet a minute. In the case of the two districts in No. 1 East, Coal Creek Colliery, where the methane production a ton of coal mined is over 4,000 cubic feet, 900 cubic feet of air a man a minute is provided in one case and over 1,000 in the other.

### Regulations for Precautions against Coal-dust.

The conditions with respect to the presence of dangerous coal-dust have been kept fairly well in hand during the year, and it is very important that this work should be continued and, if possible, improved on.

The principal means of dealing with the dangers likely to arise from the presence of fine coal-dust in the mines are by the use of water to render the roof, sides, and floor of the roadways and working-faces damp and the use of non-combustible dust on the roadways. Tests of the dust have been made regularly during the year.

Advantage was taken by the workmen at all the collieries of the privilege granted by Rule 37, section 101, of the "Coal-mines Regulation Act" *re* inspecting the mines on behalf of the workmen. This inspection is of great service to the officials as well as the workmen in maintaining safer and healthier conditions in and about the mines.

A total of 115 inspections was made in the mines of this district by men appointed on behalf of the employees under the "Coal-mines Regulation Act," section 101, Rule 37. Conditions at these inspections were found fairly good and no reports were made to this office complaining of dangerous conditions.

Searches of the workmen for articles contrary to the provisions of the "Coal-mines Regulation Act" were made and no matches, pipes, or articles were found contrary to these provisions. At Coal Creek Colliery eleven searches were made and at Michel mine and Corbin two.

### Haulage.

Haulage underground is by either compressed-air-driven hoists or locomotives, self-acting inclines or horses. In some cases the hoists are situated outside the mine and the hauling-rope led inside; in such cases steam or electricity is used for power.

Electricity is gradually replacing steam and compressed air, and during 1927 this has been done in the case of the endless haulage-rope in No. 1 East, Coal Creek. At Corbin Colliery the electric power is produced at the mine from steam-engines; at Michel and Coal Creek the additional electric power has been purchased from the East Kootenay Power Company with plants on Bull and Elk rivers.

### Lighting.

Lighting underground is by the Edison electric mine safety-lamp and the Wolf mine safety-lamp (oil). The Wolf safety-lamp is also used as a means of making a rapid determination of the mine-air as to the presence of methane (gas).

The Burrell gas-detector is in use at all the mines for determining lower percentages of methane (gas) than can be detected by the Wolf safety-lamp, as required by section 101, Rule 4, of the "Coal-mines Regulation Act."

All the lamps and Burrell gas-detectors are cleaned and tested in well-equipped lamp-stations convenient to the mines. The electric lamps are fitted with spring-locks and the Wolf flame-lamps with magnetic locks.

### Explosives.

At Michel and Corbin explosives are used for bringing down the coal. No explosives are used at Coal Creek for this purpose. At all the mines explosives are used for rock-work.

The uses of explosives in the mines are subject to Rules 11 and 12, section 101, of the "Coal-mines Regulation Act," and these have been fairly well complied with during the year.

The use of explosives for bringing down coal is attended with a certain amount of danger, and it should be distinctly understood that every precaution should be taken to avoid accidents.

In addition to the restrictions laid down by Rules 11 and 12, strict attention should be given as to the presence of methane (gas) or dust. The placing of the shot should be studied, and in no case should a second hole be drilled in a place until the first shot has been blasted and the place examined. It should be remembered that it is very difficult to accurately determine the position of a second shot until it is known exactly what work the first shot has done. Neglect of this precaution contributes to serious accidents, as frequently breaks develop in the coal-seam or the roof, where explosive gas may accumulate, difficult to detect. If shots have to be fired under doubtful conditions, then these should only be fired when a minimum number of workmen are in the mine, and if possible only the shotlighters.

The use of explosives in producing coal at Coal Creek Colliery is not in regular practice and the small amount used was only for some isolated work.

Gelpermite and CXLite are both used for rock-work, Monobel in coal, and stumping-powder in the open-cast work at Corbin.

### Coal-cutting Machinery.

No coal was produced by coal-cutters during the year.

### Mine-rescue and Ambulance Work.

The amount of mine-rescue apparatus maintained at the collieries was the same as last year and all of the same type—namely, the Gibbs. Six sets of apparatus are maintained at both Coal Creek and Michel Collieries and five at Corbin.

Copies of the special rules, extract of the "Coal-mines Regulation Act," "systematic timbering" rules, copies of daily report, and analysis of dust samples are kept posted at or near the mines and kept in fairly good condition.

We again desire to thank the workmen and officials for their co-operation and assistance in carrying out the work of inspection during 1927 and look forward to a continuation of the same during the year we are now entering upon, as it is only by having the co-operation of both the officials and the workmen that coal-mining can be made both safer and healthier.

Attached is the report covering the inspections in detail by John MacDonald, Inspector, and the annual returns as required by section 66 of the "Coal-mines Regulation Act" from the collieries for 1927.

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Report by John MacDonald, Inspector.

## Crow's Nest Pass Coal Co., Ltd.

Head Office, Fernie, B.C.

W. R. Wilson, President, Fernie, B.C.; A. H. MacNeill, Vice-President, Vancouver, B.C.; J. S. Irvine, Secretary, Fernie, B.C.; A. A. Klauer, Treasurer, Fernie, B.C.; H. P. Wilson, General Manager, Fernie, B.C.

The above company operated, during 1927, Coal Creek and Michel Collieries on the western slope of the Rocky mountains in East Kootenay Inspection District.

Coal Creek Colliery is situated at Coal Creek, about 5 miles from Fernie. Railway connection from the colliery is made with the Canadian Pacific Railway and the Great Northern Railway at Fernie, over the Morrissey, Fernie & Michel Railway.

Michel Colliery is situated on both sides of Michel creek, on the Crowsnest branch of the Canadian Pacific Railway, about 24 miles in a north-easterly direction from Fernie.

The following are the aggregate returns from the Crow's Nest Pass Coal Company's mines for the year 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 361,538 | ..... | ..... | ..... |
| Sold for export to United States | 239,502 | ..... | ..... | ..... |
| Sold for export to other countries | ..... | ..... | ..... | ..... |
| Total sales | ..... | 601,040 | ..... | ..... |
| Used in making coke | 129,933 | ..... | ..... | ..... |
| Used under colliery boilers, etc | 46,972 | ..... | ..... | ..... |
| Total for colliery use | ..... | 176,905 | ..... | ..... |
| | | 777,945 | | |
| Stocks on hand first of year | 745 | ..... | ..... | ..... |
| Stocks on hand last of year | 202 | ..... | ..... | ..... |
| Difference taken from stock during year | ..... | 543 | ..... | ..... |
| Output of colliery for year | ..... | 777,402 | ..... | ..... |

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

| Character of Labour. | Underground. | | Above Ground. | | Totals. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| Supervision and clerical assistance | 40 | ..... | 22 | ..... | 62 | ..... |
| Whites— | | | | | | |
| Miners | 456 | ..... | ..... | ..... | 456 | ..... |
| Miners' helpers | ..... | ..... | ..... | ..... | ..... | ..... |
| Labourers | 76 | ..... | 129 | ..... | 205 | ..... |
| Mechanics and skilled labour | 312 | ..... | 227 | ..... | 539 | ..... |
| Boys | 34 | ..... | 21 | ..... | 55 | ..... |
| Japanese | ..... | ..... | ..... | ..... | ..... | ..... |
| Chinese | ..... | ..... | ..... | ..... | ..... | ..... |
| Indians | ..... | ..... | ..... | ..... | ..... | ..... |
| Totals | 918 | ..... | 399 | ..... | 1,317 | ..... |

## COAL CREEK COLLIERY.

B. Caufield, Manager; J. Taylor, Assistant Manager; E. Morrison, Safety Inspector.

This colliery is situated on both sides of Coal creek and has railway connection with the Canadian Pacific and Great Northern Railways at Fernie by means of a branch line, 5 miles in length, called the Morrissey, Fernie & Michel Railway. The mines operated during 1927 were No. 1 East, No. 3, No. 2, and No. 1 South on the south side of the valley, the only one producing coal on the north side being No. 9.

A general description of the method of working, system of haulage in and about the mines, and surface plant has appeared in previous Annual Reports of the Minister of Mines. Additions to the plant in 1927 consist of electric drives installed on Nos. 2 and 3 mine-fans, also on No. 1 East haulage-engine. These are General Electric induction-motors, equipped with automatic starters and oil-type switches. Those on the fans each develop 150 horse-power, while that on No. 1 East haulage has a capacity of 125 horse-power.

The lamp used exclusively by the workmen is the Edison electric cap safety-lamp, while Wolf safety-lamps are used by the officials and bratticemen for testing purposes, all lamps being cleaned and repaired in a well-equipped lamp-room located in a central position at the colliery.

Burrell gas-detectors are provided at all the mines for the purpose of detecting lower percentages of methane than that usually found by the ordinary safety-lamp.

A large number of houses are provided at Coal Creek for the convenience of those who prefer living close to the mines, while there is a good train service to Fernie, where the majority of the workmen reside.

Copies of the "Coal-mines Regulation Act" and special rules are posted up at all the mines. Following is a brief description of the conditions prevailing in the various mines during 1927:—

### No. 1 East Mine.

J. Caufield, Overman; J. Duncan, J. Maltman, T. Reid, E. Rutledge, and R. Fowler, Firebosses.

This mine is in the eastern portion of No. 1 seam and is ventilated by an electrically driven 11- by 10-foot Sirocco fan, which, running at a speed of 174 r.p.m., produced an average quantity of 167,800 cubic feet of air a minute, under a water-gauge of 3.7 inches. The ventilation is divided into four splits, the quantities passing in each at the last inspection measuring as follows:—

*No. 1 Split.*—24,000 cubic feet of air a minute for the use of fifty-two men and ten horses. Burrell gas-detector, 1.5 per cent. methane.

*No. 2 Split.*—25,000 cubic feet of air a minute for the use of twenty-five men and five horses. Burrell gas-detector, 2 per cent. methane. NOTE.—Ventilation restricted in above split by cave on No. 20 room; this roadway was under repair at the time this inspection was made.

*No. 3 Split.*—29,400 cubic feet of air a minute for the use of twenty-five men and five horses. Burrell gas-detector, 1.9 per cent. methane.

*No. 4 Split.*—20,240 cubic feet of air a minute for the use of twenty-five men and five horses. Safety-lamp indicated 1.3 per cent. methane.

*North Return.*—108,000 cubic feet of air a minute for the use of seventy-five men and fifteen horses. Safety-lamp indicated 1 per cent. methane.

Haulage-road, 72,240 cubic feet of air a minute; travelling-road, 84,000 cubic feet of air a minute; total intake air, 156,240 cubic feet of air a minute.

East side of fan-shaft, 52,000 cubic feet of air a minute; west side of fan-shaft, 110,720 cubic feet of air a minute; total return air, 162,720 cubic feet of air a minute.

Explosive gas has been found a number of times in this mine in the course of inspection, mostly in cavities in the roof above the timbers, the nature of the roof and the method of working making it extremely difficult to prevent the formation of such cavities, where gas sometimes accumulates, generally in small quantities. Burrell readings taken regularly in the return air-currents have varied from 0.6 per cent. methane in the No. 3 split to 1.9 per cent. methane in the No. 1 split and 2 per cent. in the No. 2 split.

Roadways and timbering have been kept in fairly good shape, a good supply of timber being provided for the purpose, and the requirements of the "special timbering" rules fairly well attended to at the working-faces.

Spraying systems are operated on all roads and working-faces where required, while all main roads are treated regularly with inert dust. Two hundred and eighty-nine samples of dust were taken in this mine in accordance with Regulation No. 4 of the Coal-dust Regulations, the resultant analyses showing that 249 of these were in keeping with the requirements of the above regulation.

### No. 1 South Mine.

F. Landers, Overman; W. Hynds, W. Stockwell, and M. Hilton, Firebosses.

This mine is in the upper and western portion of No. 1 seam and is ventilated by an electrically driven 8- by 4-foot Keith fan, which, running at a speed of 254 r.p.m., produced an average quantity of 43,700 cubic feet of air a minute, under a water-gauge of 2.6 inches. Ventilation is divided into two splits, the quantities passing in each at the last inspection measuring as follows:—

*No. 1 Split.*—10,000 cubic feet of air a minute for the use of three men and three horses. Burrell gas-detector, 1.2 per cent. methane.

*No. 2 Split.*—8,500 cubic feet of air a minute for the use of forty men and eight horses. Safety-lamp indicated slight trace of methane.

*Main Return.*—42,000 cubic feet of air a minute for the use of forty-three men and eleven horses. Safety-lamp indicated 0.5 per cent. methane.

Explosive gas has been found three times in the course of inspection, while Burrell readings taken regularly in the return air-currents have varied from 0.3 per cent. methane in the No. 2 split to 2 per cent. methane in the No. 1 split.

Roadways and timbering have been kept in good shape, a good supply of timber being provided for the purpose, and the requirements of the "special timbering" rules fairly well attended to at the working-faces.

Spraying systems are operated on all roads and working-faces where required, while all main roads are treated regularly with inert dust. Two hundred and forty-nine samples of dust were taken in this mine in accordance with Regulation No. 4 of the Coal-dust Regulations, 202 of these meeting the requirements of the above regulation.

### No. 2 Mine.

C. McNay, Overman; J. Bushell, W. Clarkstone, R. Alstead, and J. Smith, Firebosses.

This mine is on the same level as the tipple and is in the upper and western portion of No. 2 seam. It is ventilated by an electrically driven 16- by 8-foot Wilson fan, which, running at a speed of 170 r.p.m., produced an average quantity of 46,500 cubic feet of air a minute, under a water-gauge of 5 inches. At the present time this mine is all on one split, the quantity passing at the last inspection measuring as follows:—

*Main Return.*—63,000 cubic feet of air a minute for the use of forty-three men and seven horses. Safety-lamp indicated slight trace of methane.

Explosive gas has been found a number of times in the course of inspection, while Burrell readings taken in the return air-currents varied from 0.3 per cent. methane to 0.9 per cent. methane.

Roadways and timbering have been kept in fairly good shape, a good supply of timber being provided for the purpose, and the requirements of the "special timbering" rules fairly well attended to at the working-faces.

Spraying systems are operated on all roads and working-faces where required, while all main roads are treated regularly with inert dust. Two hundred and fifty-two samples of dust were taken in this mine in accordance with Regulation No. 4 of the Coal-dust Regulations, 232 of these meeting the requirements of the above regulation.

A very important piece of work was practically completed in this mine in the early part of December. This consisted of a 10- by 12-foot shaft, which was driven a distance of 225 feet on a pitch of 65°, from No. 15 room in the No. 4 Incline district of No. 2 mine up to Nos. 1 and 2 South levels of No. 1 South mine, to be used as a ventilating-shaft for Nos. 2 and 3 mines as soon as the installation is complete of the new fan which is in course of erection on the mountain-side above No. 1 South mine.

When it is mentioned that almost eleven months were spent on the driving of this shaft, it gives one an idea of the nature of the strata through which it was pierced. This consisted for the greater part of the distance, 195 feet to be exact, of an exceedingly hard, close-grained conglomerate, which presented great difficulties in drilling.

I am sure it must afford great satisfaction to all those directly concerned with this particular operation when it is realized that it has been driven without the occurrence of a single serious accident of any kind.

### No. 3 Mine.

J. Biggs, Overman; R. Phillips, W. Brown, E. Caufield, and J. Chester, Firebosses.

This mine operates the lower and eastern portion of the No. 2 seam and is ventilated by an electrically driven 16- by 8-foot Wilson fan, which, running at a speed of 170 r.p.m., produced an average quantity of 63,300 cubic feet of air a minute, under a water-gauge of 5.5 inches. The ventilation is divided into two splits, the quantities passing in each at the last inspection measuring as follows:—

*No. 1 Split.*—14,500 cubic feet of air a minute for the use of fourteen men and three horses. Burrell gas-detector, 1.1 per cent. methane.

*No. 2 Split.*—38,500 cubic feet of air a minute for the use of forty-four men and eight horses. Burrell gas-detector, 1.7 per cent. methane.

*Main Return.*—60,000 cubic feet of air a minute for the use of fifty-eight men and eleven horses. Safety-lamp indicated 1.1 per cent. methane.

Explosive gas has been found four times in the course of inspection, while Burrell readings taken regularly in the return air-currents varied from 0.7 per cent. methane in the No. 1 split to 2.1 per cent. methane in the No. 2 split.

Roadways and timbering have been kept in good shape, a good supply of timber being provided for the purpose, and the requirements of the "special timbering" rules fairly well attended to at the working-faces.

Spraying systems are operated on all roads and working-faces where required, while all main roads are treated regularly with inert dust. Two hundred and seventy-two samples of dust were taken in this mine in accordance with Regulation No. 4 of the Coal-dust Regulations, 212 of these coming up to the standard set by the above regulation.

### No. 9 Mine.

J. Worthington, Overman.

A small force of men was given steady work in this mine during 1927, being engaged in driving Nos. 3 and 4 inclines from No. 9 main level up to the main haulage-level of No. 1 North mine. The No. 3 incline holed through in the latter part of the year, all work being now concentrated on the repairing of the No. 1 North main level outby from where the roadways intersect.

This mine is all on one split and is ventilated by a fan of the Guibal type, which, running at a speed of 50 r.p.m., produced an average quantity of 6,350 cubic feet of air a minute, under a water-gauge of 1 inch. The quantity of air passing at the last inspection measured as follows:—

*Main Return.*—4,800 cubic feet of air a minute for the use of seven men and two horses.

Explosive gas was found on one occasion during the course of inspection, while the percentage of methane in the return air-current has always been well under 0.5 per cent.

Roadways and timbering have been kept in good shape, a good supply of timber being provided for the purpose, and the requirements of the "special timbering" rules well attended to at the working-faces.

Following are the official returns from Coal Creek Colliery for the year ended December 31st, 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 102,814 | ..... | 17,355 | ..... |
| Sold for export to United States | 239,502 | ..... | 14,812 | ..... |
| Sold for export to other countries | ..... | ..... | ..... | ..... |
| Total sales | ..... | 342,316 | | 32,167 |
| Used in making coke | 48,300 | ..... | ..... | ..... |
| Used under colliery boilers, etc. | 30,633 | ..... | ..... | ..... |
| Total for colliery use | ..... | 78,933 | ..... | ..... |
| | | 421,249 | | |
| Stocks on hand first of year | 745 | ..... | 357 | ..... |
| Stocks on hand last of year | 202 | ..... | 536 | ..... |
| Difference taken from stock during year | ..... | 543 | ..... | 179 |
| Output of colliery for year | ..... | 420,706 | ..... | 32,346 |

Number of Hands employed, Daily Wages paid, etc. (Includes Fernie Coke-ovens.)

| Character of Labour. | Underground. | | Above Ground. | | Totals. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| Supervision and clerical assistance | 22 | ..... | 12 | ..... | 34 | ..... |
| Whites— | | | | | | |
| Miners | 251 | ..... | ..... | ..... | 251 | ..... |
| Miners' helpers | ..... | ..... | ..... | ..... | ..... | ..... |
| Labourers | 45 | ..... | 51 | ..... | 96 | ..... |
| Mechanics and skilled labour | 190 | ..... | 115 | ..... | 305 | ..... |
| Boys | 11 | ..... | 11 | ..... | 22 | ..... |
| Japanese | ..... | ..... | ..... | ..... | ..... | ..... |
| Chinese | ..... | ..... | ..... | ..... | ..... | ..... |
| Indians | ..... | ..... | ..... | ..... | ..... | ..... |
| Totals | 519 | ..... | 189 | ..... | 708 | ..... |

## MICHEL COLLIERY.

R. Bonar, Manager; M. McLean, Assistant Manager; J. Henney, Safety Inspector.

This colliery is situated on Michel creek, some 24 miles north-east of Fernie, and has railway connection with the Canadian Pacific Railway. A general description of the method of working, system of haulage in and about the mines, and surface plant has appeared in previous Annual Reports of the Minister of Mines.

As in recent years, the whole of the output of this colliery was produced by Nos. 3 and 8 mines, the operations in No. 3 East mine being confined to repairs to main roadways and attending to the pumps.

The Edison electric cap safety-lamp is used exclusively by the workmen, while Wolf safety-lamps are used by the officials and bratticemen for testing purposes, all lamps being cleaned and repaired in a well-equipped lamp-room located in a central position at the colliery. Burrell gas-detectors are provided at all the mines for the purpose of detecting lower percentages of methane than that usually found by the ordinary safety-lamp.

Copies of the "Coal-mines Regulation Act" and special rules are posted up at all the mines. Following is a brief description of the conditions prevailing in the various mines during the year:—

No. 3 Mine.

M. Littler, Overman; J. Strachan, T. Owen, R. Beard, W. Cartwright, D. James, and O. Winstanley, Firebosses; J. McAlpine, J. Seddon, J. Simister, R. Winstanley, and J. Jenkinson, Shotfirers.

This mine operates the Nos. 3, 2, 1, and A seams and is ventilated by a 12- by 6-foot Sullivan fan, which, running at a speed of 152 r.p.m., produced an average quantity of 130,600 cubic feet of air a minute, under a water-gauge of 2.8 inches. The ventilation is divided into six splits, the quantities passing in each at the last inspection measuring as follows:—

*No. 1 Split.*—3,600 cubic feet of air a minute for the use of thirteen men and three horses.

*No. 2 Split.*—21,000 cubic of air a minute for the use of fifty-six men and seven horses. Burrell gas-detector, 0.3 per cent. methane.

*No. 3 Split.*—4,320 cubic feet of air a minute for the use of twenty-two men and three horses. Note.—This does not represent the total quantity of air passing in this split, as a considerable portion of the same is passing along another roadway to the return, this being caused by a rearrangement of the ventilation at the time this inspection was made.

*No. 4 Split.*—13,680 cubic feet of air a minute for the use of twenty-one men and three horses.

*No. 5 Split.*—21,000 cubic feet of air a minute for the use of seventeen men and three horses.

*A and 1 Seams.*—21,600 cubic feet of air a minute for the use of nineteen men and three horses.

*Main Return.*—130,000 cubic feet of air a minute for the use of 148 men and twenty-two horses.

Explosive gas has been found four times in the course of inspection, while the percentage of methane in the return air-currents, as determined by the Burrell gas-detector, varied from 0.2 per cent. in the No. 2 split to 0.7 per cent. methane in the No. 3 split.

Roadways and timbering have been kept in fairly good shape, a good supply of timber being provided for the purpose, and the requirements of the "special timbering" rules fairly well attended to at the working-faces.

Spraying systems are in use on all roads and working-faces where required, while all main roads are treated regularly with inert dust. Two hundred and thirty-two samples of dust were taken in this mine in accordance with Regulation No. 4 of the Coal-dust Regulations; these, with one solitary exception, were well above the standard set by the above regulation.

An extensive scheme of development has been carried out during the year; two rock tunnels, each 970 feet in length, have been driven from the No. 1 seam to open up a new section called A seam. This averages from 12 to 16 feet in thickness, only 8 feet of the upper portion being worked at present. While it is of a friable nature, this coal is of good quality and tests taken show that a fairly good coke can be produced from it.

One of the tunnels mentioned above is in a direct line with the present Main tunnel and an extension has been driven outby a distance of 300 feet. It is estimated that another 50 feet of travel will connect these roadways; when this is completed this mine will have a straight main haulage rock tunnel, crosscutting six different seams of coal, which will have a width suitable for double tracks if necessary. At the present time the main haulage is all being relaid with heavy ties and 60-lb. steel rails.

The old back slope has all been repaired and laid to grade and will take the place of the present Main slope as a haulage-road, as the latter roadway will have to be stopped in keeping with the scheme of development outlined above.

Another rock tunnel is being driven from the main East level, a distance of 750 feet, to connect with the main return airway and will be used as a drainage-level. This will take care of practically all the water from the workings and eliminate the danger of freezing on the main haulage in extreme cold weather.

### No. 8 Mine.

C. Stubbs, Overman; R. Taylor, R. McFegan, A. Almond, E. Ainsworth, J. Wallbank, and W. McKay, Firebosses; J. Scales, Shotfirer.

This mine is in the upper portion of No. 8 seam and is ventilated by an electrically driven 8- by 3½-foot Jeffrey fan, which, running at a speed of 240 r.p.m., produced an average quantity of 73,900 cubic feet of air a minute, under a water-gauge of 2.9 inches. Ventilation is divided into two splits, the quantities passing in each at the last inspection measuring as follows:—

*No. 1 Split.*—17,850 cubic feet of air a minute for the use of twelve men and three horses. (Mine idle.)

*No. 2 Split.*—15,370 cubic feet of air a minute for the use of sixteen men and four horses.

*Main Return.*—74,250 cubic feet of air a minute for the use of twenty-eight men and seven horses.

No explosive gas was found in this mine in the course of inspection and the percentage of methane in the return air-currents has always been kept well under 0.5 per cent.

Roadways and timbering have been kept in good shape, a good supply of timber being provided for the purpose and the requirements of the "special timbering" rules fairly well attended to at the working-faces.

Spraying systems are in operation on all roads and working-faces where required, while all main roads are treated regularly with inert dust. One hundred and thirty-three samples of dust were taken in accordance with Regulation No. 4 of the Coal-dust Regulations; all but nine of these were in keeping with the standard set by the above regulations.

A great improvement has been brought about in the haulage conditions of this mine during the year. This was accomplished by cutting off the West Side jig and No. 1 incline and lowering all the coal from the West Side district down No. 6 incline. To put the latter roadway in shape as a main haulage a large amount of brushing, repairing, grading, etc., had to be done, this being spread over a period of several months. This new haulage has given splendid results since it was put in operation and reflects great credit on all concerned, especially when it is taken into consideration that the change-over had to be made in the course of a regular working-shift, due to an inrush of water on the West Side district putting the jig out of commission.

### No. 3 East Mine.

A. Ball, Fireboss.

Operations in this mine have followed along the same lines as in recent years, a small force of repairmen and one fireboss being engaged in maintenance-work and attending to the pumps.

Until the end of October this mine was ventilated by a 16- by 8-foot Wilson fan, which, running at a speed of 90 r.p.m., produced an average quantity of 72,000 cubic feet of air a minute, under a water-gauge of 1.9 inches.

The above fan caught fire on the morning of October 30th and was completely destroyed. No work was going on in No. 3 East mine at the time, but, as this fan was ventilating one district of No. 3 mine, all men were withdrawn from this mine and all entrances to the same securely fenced off. A thorough inspection was then made of both mines before any men were allowed underground.

It was assumed the fire was caused by one of the drive-ropes breaking, getting entangled around the driving-shaft, the resulting friction, coupled with the fact that there is always a certain amount of oil or grease around a structure of this kind, having the effect of creating a flame. A small electrically driven fan was immediately installed to ventilate No. 3 East mine, while construction-work was begun on a double-inlet, 8-foot diameter Jeffrey fan. This is being constructed entirely of concrete and steel and will be in operation in the early part of 1928.

The ventilation is divided into two splits, the quantities passing in each at the last inspection measuring as follows:—

*No. 1 Split.*—14,400 cubic feet of air a minute.

*No. 2 Split.*—15,000 cubic feet of air a minute.

*Main Return.*—37,800 cubic feet of air a minute for the use of three men and one horse.

No explosive gas has been found in the course of inspection, while the percentage of methane in the return air-currents, as determined by analysis of air samples sent to the Bureau of Mines, Ottawa, varied from 0.32 per cent. in No. 1 split to 0.7 per cent. methane in No. 2 split.

Roadways and timbering have been kept in good shape and generally free from coal-dust, the main roadways being regularly treated with inert dust.

Following are the official returns from Michel Colliery for the year ended December 31st, 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 258,724 | | 46,581 | |
| Sold for export to United States | | | 7,107 | |
| Sold for export to other countries | | | | |
| Total sales | | 258,724 | | 53,688 |
| Used in making coke | 81,633 | | | |
| Used under colliery boilers, etc. | 16,339 | | | |
| Total for colliery use | | 97,972 | | |
| | | 356,696 | | |
| Stocks on hand first of year | | | 1,460 | |
| Stocks on hand last of year | | | 498 | |
| Difference taken from stock during year | | | | 962 |
| Output of colliery for year | | 356,696 | | 52,726 |

Number of Hands employed, Daily Wages paid, etc. (Includes Coke-ovens.)

| Character of Labour. | Underground. | | Above Ground. | | Totals. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| Supervision and clerical assistance | 18 | | 10 | | 28 | |
| Whites— | | | | | | |
| Miners | 205 | | | | 205 | |
| Miners' helpers | | | | | | |
| Labourers | 31 | | 78 | | 109 | |
| Mechanics and skilled labour | 122 | | 112 | | 234 | |
| Boys | 23 | | 10 | | 33 | |
| Japanese | | | | | | |
| Chinese | | | | | | |
| Indians | | | | | | |
| Totals | 399 | | 210 | | 609 | |

## Corbin Coals, Ltd.

E. L. Warburton, Manager.

This colliery is situated 14 miles from McGillivray Junction on the Crowsnest branch of the Canadian Pacific Railway, to which it is connected by a branch line called the Eastern British Columbia Railway. It consists of three mines, Nos. 4, 5, and 6; the No. 3 mine, or "Big Showing," having been permanently abandoned in November, 1926. The whole of the output has come from Nos. 4 and 6 mines, no work being done in No. 5 during 1927.

A general description of the method of working, system of haulage in and about the mines, and surface plant has appeared in previous Annual Reports of the Minister of Mines. Additions

to the plant in 1927 consist of the erection of a Ruggles-Cole dryer, one Buzza screen in relation to the Arm screens, and two Wilmot jigs, together with the necessary elevators, bins, etc.

The lamp used generally by the workmen is the Edison electric cap safety-lamp, while Wolf safety-lamps are used by the officials and bratticemen for testing purposes, all lamps being cleaned and repaired in a fairly well-equipped lamp-room located in a central position at the colliery.

Copies of the "Coal-mines Regulation Act" and special rules are posted up at all the mines. Following is a brief description of the conditions prevailing in the various mines during the year:—

### No. 4 Mine.

W. Almond, Overman; G. Elmes, H. Ferryman, and J. Virgo, Firebosses.

This mine is in No. 4 seam and is ventilated by a single-inlet fan of the Guibal type, which, running at a speed of 90 r.p.m., produced an average quantity of 22,370 cubic feet of air a minute, under a water-gauge of 0.5 inch. The ventilation is divided into two splits, the quantities passing in each at the last inspection measuring as follows:—

*A Level Return.*—10,800 cubic feet of air a minute for the use of six men and one horse.

*No. 5 Level Return.*—6,000 cubic feet of air a minute. Note.—The district known as Nos. 4 and 5 levels was permanently abandoned on December 14th; the only work being done at present consists of the recovery of material.

Explosive gas was found three times in the course of inspection, while the percentage of methane in the return air-currents has always been well under 0.5 per cent.

Roadways and timbering have been kept in good shape, a good supply of timber being provided for the purpose, and the requirements of the "special timbering" rules fairly well attended to at the working-faces.

This mine, being naturally damp, has been generally free from coal-dust at all our inspections. Two samples of dust were taken in accordance with Regulation No. 4 of the Coal-dust Regulations, both of which met the requirements of the above regulation.

### No. 3 Mine, or "Big Showing."

This mine has not been operated since November, 1926, and all present indications point to it having been permanently abandoned.

### No. 5 Mine.

No work of any description was done in this mine during 1927.

### No. 6 Mine.

W. Almond, Overman; W. Commons, Shiftboss; B. Parsons, B. Cheetham, and A. Rear, Firebosses.

This mine is in No. 6 seam and is ventilated by a 36- by 54-inch Sirocco fan, which, running at a speed of 280 r.p.m., produced an average quantity of 18,200 cubic feet of air a minute, under a water-gauge of 0.4 inch. Ventilation is divided into two splits, the quantities passing in each at the last inspection measuring as follows:—

*A Level Return.*—16,800 cubic feet of air a minute for the use of twenty men and three horses.

*No. 2 Level Return.*—16,000 cubic feet of air a minute for the use of sixteen men and one horse.

*Fan Intake.*—49,000 cubic feet of air a minute for the use of thirty-six men and four horses.

Explosive gas was found twice in the course of inspection, while the percentage of methane in the return air-currents has always been under 0.5 per cent.

Roadways and timbering have been kept in fairly good shape, a good supply of timber being provided for the purpose, and the requirements of the "special timbering" rules fairly well attended to at the working-faces.

This mine for the most part has been naturally damp and generally free from coal-dust. Three samples of dust were taken in accordance with Regulation No. 4 of the Coal-dust Regulations, two of which came up to the requirements of the above regulation.

No mention has been made in this report of the explosion which occurred in this mine on October 1st, 1927, as this has been fully dealt with in the report by Senior Inspector R. Strachan.

Following are the official returns from Corbin Colliery for the year ended December 31st, 1927:—

| Sales and Output for Year. | Coal. | | Coke. | |
|---|---|---|---|---|
| (Tons of 2,240 lb.) | Tons. | Tons. | Tons. | Tons. |
| Sold for consumption in Canada | 83,940 | ..... | ..... | ..... |
| Sold for export to United States | 32,493 | ..... | ..... | ..... |
| Sold for export to other countries | ..... | ..... | ..... | ..... |
| Total sales | ..... | 116,433 | ..... | ..... |
| Used in making coke | ..... | ..... | ..... | ..... |
| Used under colliery boilers, etc | 8,457 | ..... | ..... | ..... |
| Total for colliery use | ..... | 8,457 | ..... | ..... |
| | | 124,890 | | |
| Stocks on hand first of year | 27,732 | ..... | ..... | ..... |
| Stocks on hand last of year | 32,959 | ..... | ..... | ..... |
| Difference added to stock during year | ..... | 5,227 | ..... | ..... |
| Output of colliery for year | ..... | 130,117 | ..... | ..... |

Number of Hands employed, Daily Wages paid, etc.

| Character of Labour. | Underground. | | Above Ground. | | Totals. | |
|---|---|---|---|---|---|---|
| | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. | No. employed. | Average Daily Wage. |
| Supervision and clerical assistance | 8 | ..... | 11 | ..... | 18 | ..... |
| Whites— | | | | | | |
| Miners | 65 | ..... | ..... | ..... | 65 | ..... |
| Miners' helpers | 12 | ..... | ..... | ..... | 12 | ..... |
| Labourers | 21 | ..... | 23 | ..... | 44 | ..... |
| Mechanics and skilled labour | 9 | ..... | 25 | ..... | 34 | ..... |
| Boys | ..... | ..... | 3 | ..... | 3 | ..... |
| Japanese | ..... | ..... | ..... | ..... | ..... | ..... |
| Chinese | ..... | ..... | ..... | ..... | ..... | ..... |
| Indians | ..... | ..... | ..... | ..... | ..... | ..... |
| Totals | 115 | ..... | 62 | ..... | 177 | ..... |

# GOVERNMENT MINE-RESCUE STATIONS.

Mine-rescue stations are established under authority of section 117, "Coal-mines Regulation Act," for the purpose of supplementing in case of need the colliery installations of mine-rescue apparatus, and also for the purpose of training holders of certificates of competency in the use of mine-rescue apparatus. In cases of emergency these stations are available for the use of any trained corps of mine-rescuers, duly qualified medical practitioners, or corps trained in the work of first aid to the injured, subject always to the order of an Inspector.

Numerous calls were received during 1927 for the use of the oxygen resuscitation apparatus from different hospitals. Four stations are established, as follows:—

*Nanaimo.*—J. D. Stewart, Instructor; serves the coal-mines in the Nanaimo area of the Vancouver Island Inspection District.

*Cumberland.*—John Thomson, Instructor; serves the coal-mines in the Comox area of the Vancouver Island Inspection District.

*Middlesboro.*—W. C. Stone, Instructor; serves the coal-mines in the Nicola-Princeton Inspection District.

*Fernie.*—John T. Puckey, Instructor; serves the coal-mines in the East Kootenay Inspection District.

## MINE-RESCUE STATION, NANAIMO.

Report by J. D. Stewart, Instructor.

I have the honour to submit herewith my annual report as Instructor of Government Mine-rescue station, Nanaimo, for the year ended December 31st, 1927.

There were several calls from the Nanaimo Hospital during the year to administer oxygen to patients who were in a very serious condition.

During the year a keener interest in mine-rescue work has been shown than for some time past, especially just prior to the annual mine-rescue and first-aid competition held on Labour Day. It would seem that the alterations in conducting this meet has had a beneficial effect in restoring interest in this work.

Perhaps one of the outstanding features of these changes is that the annual competition is to be held in Nanaimo, as it is the most central position, and that a permanent mine structure has been erected there, thus saving a great deal of labour and expense to construct a suitable demonstration mine at one or other of the centres.

Another feature is that in addition to the Labour Day competition there will be a competition and demonstration of first-aid and mine-rescue methods during the winter months. It is hoped that this will be the means of increasing interest in this valuable work.

During the month of August, 1927, a series of demonstrations was given showing the use and adaptability of the Burrell all-service gas-mask. Men from every local centre attended and tried the mask, every one expressing approval. Altogether eighty-five men demonstrated the use of the mask.

In addition to the practice-training of experienced teams during the year, twelve new men completed the full training course and obtained certificates of competency for mine-rescue work.

This station is equipped with six sets of the Gibbs apparatus, six sets of the Paul apparatus, twelve sets of the Burrell all-service gas-masks, and fifty self-rescuers. Ample supplies are kept on hand for the maintenance of the above apparatus in service.

## MINE-RESCUE STATION, CUMBERLAND.

Report by John Thomson, Instructor.

I have the honour to submit my annual report for the year ended December 31st, 1927, Mine-rescue Station, Cumberland.

During the year twelve employees of the Canadian Collieries (Dunsmuir), Limited, carried out a regular training with the apparatus every week.

A fire was discovered in a section of No. 4 mine, Comox Colliery, on March 27th, and an emergency call was made for the use of apparatus to assist in sealing off the fire. The men used the Burrell all-service gas-mask for this work and found this apparatus to be very satisfactory. This was the first occasion that the Burrell had been used underground in this district.

The equipment maintained at this station consists of six sets of Paul oxygen apparatus, twelve sets of Burrell all-service gas-masks, twenty-five self-rescuers, one pulmotor, one H.H. inhalator, and one refilling-pump. An adequate stock of supplies is kept on hand to maintain the above apparatus in service. In addition to above, four sets of Paul apparatus, owned by Canadian Collieries (Dunsmuir), Limited, are housed in this station.

No new men took the training course during the year.

Two teams from this district competed at the mine-rescue competition held at Nanaimo on Labour Day.

## MINE-RESCUE STATION, MIDDLESBORO.

Report by William C. Stone, Instructor.

As caretaker and instructor of the Middlesboro Mine-rescue Station, I beg to submit the following report for the year 1927:—

The equipment at this station consists of five sets of Paul apparatus, four sets of Gibbs apparatus, six sets of the Burrell all-service gas-masks, twelve self-rescuers, pulmotor, and first-aid requisites.

During the year all who have shown interest in mine-rescue work have been given thorough instruction in the use of the different types of apparatus.

On two occasions during the year the Burrell all-service gas-mask was called into service in dealing with underground fire areas, one in Coalmont Colliery and one in Middlesboro Colliery. The men using the Burrell all-service gas-mask on above occasions expressed the opinion that this apparatus for fighting fires was an improvement.

An adequate supply of materials to maintain above apparatus in service is kept on hand.

## MINE-RESCUE STATION, FERNIE.

Report by John T. Puckey, Instructor.

I have the honour to submit my annual report for the year ended December 31st, 1927.

This station was maintained in readiness for any emergencies during the year. On the occasion of the explosion at Corbin on October 1st the apparatus was made ready for immediate transportation to the scene of the accident, but was not required.

The meetings of the East Kootenay Mines Safety Association and St. John first-aid classes were held in the station and were well attended.

Arrangements have been made for experienced mine-rescue teams to carry out a regular course of practice at least every month.

The equipment at this station consists of six sets of the Gibbs self-contained oxygen apparatus, twelve sets of the Burrell all-service gas-masks, and fifty self-rescuers. Adequate supplies to maintain the above apparatus in service are kept on hand.

# BOARD OF EXAMINERS FOR COAL-MINE OFFICIALS.

## FIRST-, SECOND-, AND THIRD-CLASS CERTIFICATES AND MINE-SURVEYING CERTIFICATES.

Report by James Strang, Secretary to the Board.

I have the honour to submit herewith the annual report of transactions of the above Board for the year ended December 31st, 1927.

The Board of Examiners, which was formed on July 1st, 1919, at present consists of James Dickson, Chief Inspector of Mines, as Chairman; Harry Ernest Miard, member; and James Strang, member and Secretary of the Board. The meetings of the Board are held in the office of the Mines Department, Victoria. The examinations are held in accordance with the rules made by the Provincial Board of Examiners and approved by the Minister of Mines, July 10th, 1919.

In April, 1927, an amendment was made to Rule 13, allowing the candidates the use of an approved text-book at the examination.

The scope of the examination conducted by the Board must necessarily extend with the almost constant introduction of new methods and improvements in mining practice, and the amount of data that it would be necessary for the candidate to memorize would soon reduce the examination to a test of memory rather than a test of knowledge of the science of mining. It is the opinion of the Board that the use of some approved work of reference at examinations will tend to raise the already high standard set, and the thoroughly trained candidate will be able to obtain the modicum of information that he may require in order to give excellent answers; but the ill-prepared is more likely to find this innovation a hindrance, for the time allowed to each paper is little more than sufficient to answer it and offers no opportunity for clumsy attempts to study the subject treated.

Two examinations were held in 1927; the first was held on May 18th, 19th, and 20th, and the second on November 16th, 17th, and 18th.

The total number of candidates at these examinations was as follows: For First-class Certificates, 3 (1 passed and 2 failed); for Second-class Certificates, 9 (4 passed and 5 failed); for Third-class Certificates, 16 (7 passed and 9 failed); for Mine Surveyor Certificates, 3 (2 passed and 1 failed).

The following is a list of the candidates who successfully passed in the various classes:—

*First-class Candidate.*—Thomas M. Wilson.

*Second-class Candidates.*—James Littler, John Johnston, William Chapman, and William M. Frew.

*Third-class Candidates.*—Daniel M. Waddington, Albert E. Rear, Albert Parsons, Samuel Barr, John B. Elliott, Garnet S. Corbett, and Jonathan Jenkinson.

*Mine Surveyor Candidates.*—James Edward and Frank McKenzie.

The attention of mining students, who have not the opportunity of attending evening schools where the subject of mining is taught, is directed to the correspondence course in mining provided by the Department of Education. To those who intend to qualify as mine officials this course of study would be of immense advantage.

### Examinations for Certificates of Competency as Coal-miners.

In addition to the examinations and certificates already specified as coming under the Board of Examiners, the Act further provides that every coal-miner shall be the holder of a certificate of competency as such. By "miner" is meant a person employed underground in any coal-mine to cut, shear, break, or loosen coal from the solid, whether by hand or machinery.

The work of the Board of Examiners in examining candidates has been carried out in all mining districts at intervals of not less than sixty days, as required by the amendment of the Act.

No certificate has been granted in any case where the candidate failed to satisfy the Board as to his general fitness, experience in a coal-mine, and a working knowledge of the English language. During 1927 examinations have been held for candidates for certificates of competency as coal-miners in the various coal-mining districts of the Province.

Three hundred and fourteen candidates presented themselves for examination; 299 passed and fifteen failed to qualify.

In addition to the above, a number of duplicate certificates were issued to coal-miners who had lost their original certificate of competency.

The Board of Examiners desires to thank the different coal-mining companies for the use of their premises for holding these examinations.

The Inspector of Mines in each district has authority, under the amendment (1919) to "Coal-mines Regulation Act," to grant, after a satisfactory examination, a provisional certificate of competency as a coal-miner to applicants, which entitles the holder to follow the occupation of a coal-miner for a period not exceeding sixty days, or until the date of the next regular examination before the Board.

# REGISTERED LIST OF HOLDERS OF CERTIFICATES OF COMPETENCY AS COAL-MINE OFFICIALS.

## First-class Certificates of Competency issued under "Coal-mines Regulation Act, 1897."

| Name. | Date. | Name. | Date. |
|---|---|---|---|
| Shepherd, Francis H. | Mar. 5, 1881 | Stockett, Thomas, Jr. | Aug. 3, 1901 |
| Honobin, William | May 1, 1882 | Cunliffe, John | Aug. 3, 1901 |
| Little, Francis D. | May 1, 1882 | Evans, Daniel | Aug. 3, 1901 |
| Chandler, William | Dec. 21, 1883 | Browitt, Benjamin | Aug. 3, 1901 |
| Priest, Elijah | Dec. 21, 1883 | McEvoy, James | Oct. 17, 1902 |
| Randle, Joseph | Jan. 18, 1888 | Wilson, A. R. | Oct. 17, 1902 |
| Matthews, John | Jan. 8, 1889 | Simister, Charles | Oct. 17, 1902 |
| Norton, Richard Henry | Aug. 26, 1889 | Budge, Thomas | Oct. 17, 1902 |
| Kesley, John | Mar. 4, 1892 | Richards, James A. | Oct. 17, 1902 |
| Wall, William H. | May 30, 1896 | McLean, Donald | Jan. 21, 1904 |
| Wilson, David | May 30, 1896 | Wright, H. B. | Jan. 21, 1904 |
| Smith, Frank B. | May 30, 1896 | Coulthard, R. W. | Jan. 21, 1904 |
| Bradshaw, George B. | June 12, 1899 | Roaf, J. Richardson | Jan. 21, 1904 |
| Simpson, William G. | June 12, 1899 | John, John | Jan. 21, 1904 |
| Hargreaves, James | Feb. 5, 1901 | Manley, H. L. | Jan. 21, 1904 |
| Drinnan, Robert G. | Feb. 5, 1901 | | |

## First-class Certificates issued under "Coal-mines Regulation Act Further Amendment Act," 1904–1911–1919.

| Name. | Date. | Name. | Date. |
|---|---|---|---|
| Baxter, Andrew | June 10, 1911 | Graham, Thomas | Nov. 9, 1907 |
| Battey, Richard | May 27, 1913 | Gray, James | Nov. 27, 1909 |
| Bennett, John | Dec. 30, 1926 | Henderson, Robert | Nov. 27, 1909 |
| Biggs, J. G. | July 22, 1908 | Hewlett, Howe | May 27, 1913 |
| Bonar, Robert | Oct. 28, 1911 | Higgins, Alexander | Dec. 19, 1918 |
| Brace, Tom | May 13, 1915 | Hodge, William K. | June 16, 1925 |
| Bridge, Edward | July 22, 1908 | Holden, James | May 1, 1909 |
| Brown, David | May 21, 1914 | Howden, Archibald | May 27, 1913 |
| Brown, Robert Joyce | May 13, 1915 | Howells, Nathaniel | Oct. 28, 1911 |
| Caufield, Bernard | May 1, 1909 | Hughes, John C. | May 17, 1917 |
| Church, James A. H. | June 10, 1911 | Humphries, Clifford | June 10, 1911 |
| Cox, Richard | May 13, 1915 | Hunter, Alex. B. | July 8, 1916 |
| Crowder, James | June 10, 1911 | Huntrods, Eustace S. F. | May 19, 1922 |
| Cunningham, John Howard | May 9, 1912 | Jackson, Thos. R. | Nov. 9, 1907 |
| Davidson, W. A. | May 1, 1909 | Jaynes, Frank | May 13, 1915 |
| Davies, David | June 10, 1911 | Jemson, Jas. W. | May 27, 1913 |
| Davies, Stephen | Nov. 15, 1917 | Kellock, George | June 10, 1911 |
| Davies, Thos. Owen | May 21, 1914 | Knox, T. K. | July 27, 1909 |
| de Hart, J. B. | May 17, 1917 | Laird, Robert | Nov. 15, 1917 |
| Derbyshire, James | Nov. 9, 1907 | Leighton, Henry | May 9, 1912 |
| Devlin, E. H. | Dec. 30, 1926 | Mackinnon, Hugh G. | May 19, 1922 |
| Devlin, Henry | May 1, 1909 | Macauley, D. A. | June 10, 1911 |
| Dickson, James | Oct. 31, 1912 | McCulloch, James | Sept. 10, 1910 |
| Elliott, Daniel | Nov. 9, 1907 | McDonald, John | Oct. 3, 1919 |
| Emmerson, Joseph | Nov. 9, 1907 | McGuckie, Thomas | July 22, 1908 |
| Ewart, William | May 19, 1922 | McKendrick, Andrew | May 27, 1913 |
| Fairfoull, Robert | June 10, 1911 | McLean, Michael D. | June 16, 1925 |
| Foster, William R. | Dec. 31, 1925 | McMillan, J. H. | Sept. 10, 1910 |
| France, Thos. | Nov. 22, 1906 | McVicar, Samuel | May 1, 1909 |
| Fraser, Norman | Mar. 4, 1905 | Mazey, William John | Oct. 31, 1912 |
| Freeman, H. N. | May 1, 1909 | Miard, Henry Ernest | May 9, 1912 |
| Galloway, C. F. J. | July 22, 1908 | Millar, John K. | Nov. 22, 1906 |
| Garman, Morris W. | Nov. 15, 1917 | Miller, Andrew Anderson | Oct. 31, 1912 |
| Gascoyne, Rowland B. | May 21, 1914 | Montgomery, John W. | May 1, 1909 |
| Gillham, John | Jan. 5, 1925 | Moore, Wm. H. | May 17, 1917 |
| Glover, Francis | Oct. 31, 1912 | Mordy, Thomas | Sept. 10, 1910 |
| Graham, Charles | Nov. 14, 1905 | Morrison, Edward | June 24, 1924 |

FIRST-CLASS CERTIFICATES ISSUED UNDER "COAL-MINES REGULATION ACT FURTHER AMENDMENT ACT," 1904–1911–1919—*Continued.*

| Name. | Date. | Name. | Date. |
|---|---|---|---|
| Mottishaw, Sam. K. | Nov. 15, 1917 | Stewart, R. T. | Sept. 10, 1910 |
| Murray, George | June 21, 1921 | Strachan, Robert | Mar. 4, 1905 |
| Newbury, Arthur | June 21, 1920 | Strang, James | June 10, 1911 |
| O'Brien, George | May 21, 1914 | Taylor, James | May 16, 1918 |
| Ovington, John | May 27, 1913 | Thomas, J. D. | Sept. 10, 1910 |
| Peacock, Frank David | Oct. 28, 1911 | Thorne, B. L. | Sept. 10, 1910 |
| Penman, Hugh | May 21, 1914 | Touhey, James | May 21, 1914 |
| Phelan, Arthur | May 27, 1913 | Vincent, Thomas C. | June 24, 1924 |
| Powell, J. W. | June 10, 1911 | Walker, William | May 16, 1918 |
| Quinn, John Graham | July 8, 1916 | Wallbank, J. | Sept. 10, 1910 |
| Ramsay, Peter Millar | May 16, 1918 | Warburton, Ernest Leonard | July 8, 1916 |
| Roper, William | May 13, 1915 | Wark, Samuel David | Oct. 3, 1919 |
| Russell, John | May 21, 1914 | Wesnedge, William | Dec. 19, 1918 |
| Scott, Thomas Wright | Dec. 22, 1921 | Whittaker, John | Dec. 19, 1918 |
| Shanks, John | May 1, 1909 | Williams, Jahn Samuel | Dec. 19, 1918 |
| Shenton, T. J. | Sept. 10, 1910 | Williams, Thos. B. | May 17, 1917 |
| Shone, Samuel | May 1, 1909 | Williams, Thos. H. | Nov. 22, 1906 |
| Smith, A. E. | Oct. 28, 1911 | Wilson, Ridgeway R. | Nov. 15, 1917 |
| Smith, Joseph | July 22, 1908 | Wilson, Thos. M. | Dec. 23, 1927 |
| Smith, Thos. Edwin | Dec. 19, 1918 | Wilson, William | May 16, 1918 |
| Spicer, J. E. | Oct. 28, 1911 | Wylie, John | July 22, 1908 |
| Spruston, T. A. | Nov. 27, 1909 | Yates, Frank | Dec. 31, 1925 |
| Stevens, L. C. | Nov. 27, 1909 | | |

SECOND-CLASS CERTIFICATES OF SERVICE.

| Name. | Date. | No. | Name. | Date. | No. |
|---|---|---|---|---|---|
| Lee, John S. | Mar. 4, 1905 | B 9 | Walker, David | Mar. 4, 1905 | B 14 |
| Millar, J. K. | Mar. 4, 1905 | B 10 | Powell, William Baden | Mar. 4, 1905 | B 16 |
| McCliment, John | Mar. 4, 1905 | B 11 | Bryden, Alexander | Mar. 4, 1905 | B 18 |
| Hunt, John | Mar. 4, 1905 | B 13 | | | |

SECOND-CLASS CERTIFICATES OF COMPETENCY ISSUED UNDER "COAL-MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904."

| Name. | Date. | No. | Name. | Date. | No. |
|---|---|---|---|---|---|
| Adamson, Robert | Sept. 10, 1910 | B 120 | Brown, James L. | Oct. 28, 1911 | B 136 |
| Allan, Alex. McDiarmid | May 27, 1913 | B 167 | Brown, John C. | Oct. 23, 1906 | B 39 |
| Almond, Walter | Nov. 15, 1917 | B 213 | Brown, John Todd | May 9, 1912 | B 150 |
| Alstead, Robert | June 24, 1924 | B 257 | Brown, R. J. | Oct. 28, 1911 | B 134 |
| Archibald, William | Nov. 22, 1922 | B 250 | Brown, Robert | May 21, 1914 | B 183 |
| Ball, Benjamin | June 21, 1920 | B 235 | Brown, Robert Sneddon | May 13, 1915 | B 196 |
| Barclay, Andrew | July 29, 1905 | B 25 | Brown, William Gold | Dec. 19, 1918 | B 228 |
| Barlow, Benjamin Robt. | Dec. 19, 1918 | B 229 | Brownrigg, John H. | May 17, 1917 | B 124 |
| Bastian, Albert | Nov. 21, 1923 | B 256 | Bushell, J. P. | May 1, 1909 | B 81 |
| Baybutt, Thomas | July 8, 1916 | B 206 | Carroll, Henry | July 22, 1908 | B 62 |
| Bell, John | May 17, 1917 | B 212 | Caufield, Bernard | Oct. 23, 1906 | B 30 |
| Beveridge, William | June 21, 1920 | B 233 | Caufield, John | July 8, 1916 | B 199 |
| Bevis, Nathaniel | Sept. 10, 1910 | B 123 | Cawthorne, L. | May 1, 1909 | B 93 |
| Biggs, John | May 1, 1909 | B 94 | Challinor, Jno. Thomas | May 27, 1913 | B 169 |
| Biggs, John G. | Nov. 2, 1907 | B 40 | Challoner, Jno. Arthur | May 21, 1914 | B 178 |
| Blair, James | May 13, 1915 | B 197 | Chapman, Wm. | June 10, 1927 | B 268 |
| Brace, Tom | Nov. 27, 1909 | B 96 | Churchill, James | July 22, 1908 | B 65 |
| Bridge, Edward | Oct. 23, 1906 | B 33 | Clark, Robt. | June 21, 1921 | B 242 |
| Brown, David | Sept. 10, 1910 | B 108 | Clarkstone, Wm. W. | May 21, 1914 | B 180 |
| Brown, George | Dec. 19, 1918 | B 225 | Commons, Wm. | Sept. 10, 1910 | B 115 |

SECOND-CLASS CERTIFICATES OF COMPETENCY ISSUED UNDER "COAL-MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904"—*Continued.*

| Name. | Date. | No. | Name. | Date. | No. |
|---|---|---|---|---|---|
| Coupland, George | May 16, 1918 | B 217 | Jones, William T. | July 22, 1908 | B 66 |
| Courtney, A. W. | Oct. 28, 1911 | B 138 | Jordon, Thos. | Nov. 27, 1909 | B 104 |
| Cox, Richard | May 9, 1912 | B 143 | Joyce, Walter | May 27, 1913 | B 168 |
| Crawford, David | May 1, 1909 | B 88 | Kirkwood, John R. | Oct. 31, 1912 | B 160 |
| Cunliffe, Thomas | May 1, 1909 | B 78 | Knowles, James E. | Oct. 28, 1911 | B 137 |
| Dando, John | May 27, 1913 | B 164 | Laird, Robert | May 17, 1917 | B 210 |
| Daniels, David | Nov. 2, 1907 | B 53 | Lander, Frank | May 13, 1915 | B 195 |
| Derbyshire, James | Oct. 23, 1906 | B 32 | Lane, Joseph | May 9, 1912 | B 142 |
| Davidson, Hugh | May 27, 1913 | B 165 | Lee, Robert John | Sept. 10, 1910 | B 110 |
| Davies, Stephen | Sept. 10, 1910 | B 113 | Littler, Jas. | June 10, 1927 | B 266 |
| Dennis, Fred. W. | May 21, 1914 | B 174 | Littler, Matthew | Oct. 31, 1912 | B 157 |
| Devlin, Ernest H. | May 21, 1914 | B 179 | Luck, George | June 10, 1911 | B 128 |
| Dewar, Alexander | Oct. 31, 1912 | B 162 | Manifold, Albert | May 9, 1912 | B 145 |
| Dickenson, Clifford | May 13, 1915 | B 189 | Marsh, John | Nov. 15, 1917 | B 216 |
| Dunsmuir, John | Nov. 14, 1905 | B 26 | Mason, Joseph | May 13, 1915 | B 193 |
| Duncan, James | Nov. 21, 1923 | B 255 | Massey, H. | Nov. 27, 1909 | B 99 |
| Dykes, J. W. | May 1, 1909 | B 77 | Mather, Thomas | June 10, 1911 | B 127 |
| Eccleston, Wm. | May 1, 1909 | B 87 | Matusky, A. | May 1, 1909 | B 91 |
| Fairfoull, James | May 21, 1914 | B 186 | Mayer, Ralph Waldo | May 9, 1912 | B 144 |
| Fairfoull, R. | May 1, 1909 | B 83 | Mazay, W. J. | Nov. 27, 1909 | B 101 |
| Finlayson, James | July 29, 1905 | B 21 | Menzies, Fred | Dec. 22, 1921 | B 244 |
| Ford, Allan | May 27, 1913 | B 171 | Merryfield, William | July 22, 1908 | B 61 |
| Foster, W. R. | Nov. 27, 1909 | B 102 | Miard, Hy. E. | Sept. 10, 1910 | B 107 |
| France, Thos. | May 14, 1905 | B 27 | Michek, John | May 17, 1917 | B 188 |
| Francis, David M. | May 21, 1914 | B 182 | Middleton, Robert | July 22, 1908 | B 72 |
| Francis, Enoch | May 1, 1909 | B 86 | Mitchell, Henry | July 8, 1916 | B 201 |
| Francis, James | July 22, 1908 | B 63 | Monks, James | Nov. 2, 1907 | B 55 |
| Frater, George | July 8, 1916 | B 204 | Moore, Wm. H. | May 21, 1914 | B 173 |
| Freeman, Henry N. | Nov. 2, 1907 | B 45 | Morgan, John | Nov. 2, 1907 | B 43 |
| Frew, Wm. M. | June 10, 1927 | B 269 | Morgan, William | Dec. 19, 1918 | B 224 |
| Garbett, Richard | Oct. 31, 1912 | B 161 | Morgan, Daniel | Nov. 21, 1923 | B 254 |
| Garman, Morris Wilbur | Oct. 31, 1912 | B 155 | Morris, John | July 22, 1908 | B 67 |
| Gilham, John | June 21, 1920 | B 237 | Morrison, Edward | Nov. 21, 1923 | B 253 |
| Gillespie, Hugh | July 29, 1905 | B 24 | Morton, Robert W. | July 22, 1908 | B 59 |
| Gillespie, John | Oct. 23, 1906 | B 36 | Mottishaw, S. K. | Oct. 28, 1911 | B 135 |
| Gould, Alfred | May 13, 1915 | B 190 | Murray, George | Oct. 3, 1919 | B 232 |
| Gourlay, Robert | Dec. 19, 1918 | B 227 | Musgrave, J. | May 1, 1909 | B 90 |
| Graham, Chas. | Mar. 4, 1905 | B 1 | Myers, Peter | May 9, 1912 | B 149 |
| Gray, David | May 1, 1909 | B 76 | MacKinnon, Hugh G. | Dec. 22, 1921 | B 243 |
| Gray, George | July 8, 1916 | B 207 | McKay, Walter | June 30, 1926 | B 262 |
| Greenwell, Archibald | May 16, 1918 | B 220 | McLaughlin, Alex | May 13, 1915 | B 191 |
| Hamilton, Robert N. | May 21, 1914 | B 175 | McDonald, J. A. | Oct. 28, 1911 | B 133 |
| Hastings, Andrew P. | Dec. 19, 1918 | B 223 | McDonald, John | May 27, 1913 | B 172 |
| Henderson, Robert | July 22, 1908 | B 60 | McFegan, W. | Nov. 31, 1909 | B 106 |
| Hodge, William K. | Jan. 5, 1925 | B 259 | McFegan, Robert | May 18, 1922 | B 246 |
| Holliday, William | Dec. 19, 1918 | B 230 | McGarry, Martin | Oct. 31, 1912 | B 156 |
| Horrocks, Abner G. | June 10, 1911 | B 130 | McGuckie, Thomas M. | Oct. 23, 1906 | B 35 |
| Houston, Robert | June 16, 1925 | B 260 | McKelvie, J. | May 1, 1909 | B 92 |
| Howells, Nathaniel | Nov. 27, 1909 | B 97 | McKendrick, And. | Sept. 10, 1910 | B 112 |
| Hudson, George | Sept. 10, 1910 | B 121 | McLean, Michael D. | June 21, 1920 | B 234 |
| Hughes, John C. | Sept. 10, 1910 | B 109 | McMillan, D. | June 10, 1911 | B 125 |
| Hutton, Isaac | May 21, 1914 | B 185 | McNay, Carmichael | May 9, 1912 | B 151 |
| Hutton, John | May 9, 1912 | B 154 | McPherson, James E. | July 22, 1908 | B 73 |
| Hynds, William | Dec. 14, 1920 | B 240 | McWhirter, James | June 30, 1926 | B 263 |
| Hynds, John | May 18, 1922 | B 247 | Neen, Joseph | June 10, 1911 | B 129 |
| Jackson, Thos. R. | Mar. 4, 1905 | B 5 | Newbury, Arthur | May 21, 1914 | B 184 |
| James, David | Nov. 2, 1907 | B 58 | Newton, Wm. | Sept. 10, 1910 | B 116 |
| Jarrett, Fred | May 1, 1909 | B 84 | Nicholl, Joseph O. | Dec. 31, 1925 | B 261 |
| Jaynes, Frank | Sept. 10, 1910 | B 111 | O'Brien, Charles | May 9, 1912 | B 148 |
| John, Francis | July 8, 1916 | B 200 | O'Brien, George | May 1, 1909 | B 82 |
| John, Howell | Sept. 10, 1910 | B 122 | Osborne, Hugh | Dec. 14, 1920 | B 239 |
| Johnson, Moses | May 1, 1909 | B 75 | Ovington, John | Nov. 2, 1907 | B 52 |
| Johnston, John | June 10, 1927 | B 267 | Park, William | June 21, 1920 | B 238 |
| Jones, Samuel | May 16, 1918 | B 221 | Parkinson, T. | May 1, 1909 | B 80 |

SECOND-CLASS CERTIFICATES OF COMPETENCY ISSUED UNDER "COAL-MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904"—*Continued.*

| Name. | Date. | No. | Name. | Date. | No. |
|---|---|---|---|---|---|
| Parnham, Charles | Nov. 2, 1907 | B 49 | Stubbs, Clement | May 18, 1922 | B 245 |
| Quinn, James | May 21, 1914 | B 181 | Sutherland, John | May 16, 1918 | B 218 |
| Quinn, John | May 9, 1912 | B 146 | Taylor, James | May 13, 1915 | B 194 |
| Ramsay, Peter Millar | May 17, 1917 | B 209 | Taylor, Robt. | Dec. 30, 1926 | B 265 |
| Rankin, Geo. | Nov. 27, 1909 | B 103 | Taylor, Thomas | July 8, 1916 | B 203 |
| Raynes, M. T. | Oct. 28, 1911 | B 139 | Thomas, J. B. | Nov. 27, 1909 | B 105 |
| Reid, Wm. | Oct. 28, 1911 | B 132 | Thomas, Joseph D. | Oct. 23, 1906 | B 38 |
| Renny, James | Oct. 28, 1911 | B 140 | Thomas, Daniel W. | Nov. 22, 1922 | B 249 |
| Richards, Thomas | Nov. 2, 1907 | B 57 | Thompson, Joseph | Sept. 10, 1910 | B 114 |
| Richards, Samuel | May 9, 1912 | B 152 | Touhey, James | May 9, 1912 | B 147 |
| Rigby, John | July 29, 1905 | B 29 | Touhey, William | July 8, 1916 | B 205 |
| Roberts, Ebenezer | Sept. 10, 1910 | B 117 | Tonge, Thomas | July 22, 1908 | B 71 |
| Robinson, William | July 22, 1908 | B 69 | Tully, Thomas | Nov. 15, 1917 | B 214 |
| Rogers, George | May 1, 1909 | B 79 | Vanhulle, Peter | Nov. 2, 1907 | B 54 |
| Roper, William | May 9, 1912 | B 141 | Virgo, John | May 1, 1909 | B 89 |
| Rowbottom, Thomas | May 16, 1918 | B 222 | Walker, William | May 13, 1915 | B 192 |
| Russell, John | Nov. 2, 1907 | B 47 | Warburton, Ernest L. | May 27, 1913 | B 170 |
| Rutherford, Jasper | May 16, 1918 | B 219 | Watson, Adam G. | Nov. 14, 1905 | B 28 |
| Scarpino, Francis | Dec. 19, 1918 | B 226 | Watson, Arthur W. | May 17, 1917 | B 211 |
| Scott, Thomas Wright | June 21, 1921 | B 241 | Webster, James S. | June 24, 1924 | B 258 |
| Shanks, David | Oct. 31, 1912 | B 159 | Wesnedge, William | Nov. 27, 1909 | B 98 |
| Shaw, Thomas John | May 27, 1913 | B 166 | White, John | Nov. 2, 1907 | B 48 |
| Smith, John | Oct. 3, 1919 | B 231 | Whitehouse, William | Oct. 31, 1912 | B 163 |
| Smart, Robert K. | Nov. 22, 1922 | B 248 | Williams, John Samuel | Nov. 15, 1917 | B 215 |
| Somerville, Alex. | Mar. 4, 1905 | B 4 | Williams, Watkin | Sept. 10, 1910 | B 118 |
| Spruston, Robert Lecce | July 8, 1916 | B 202 | Wilson, Robinson | May 21, 1914 | B 177 |
| Spruston, Thos. A. | Nov. 2, 1907 | B 46 | Wilson, Thomas | July 22, 1908 | B 74 |
| Stafford, Matthew | June 10, 1911 | B 131 | Wilson, William | July 22, 1908 | B 70 |
| Stewart, J. M. | May 1, 1909 | B 95 | Wood, Thos. James | May 21, 1914 | B 176 |
| Stobbart, Jacob | May 9, 1912 | B 153 | Worthington, Joseph | May 1, 1909 | B 85 |
| Stockwell, William | Nov. 2, 1907 | B 56 | Yates, Frank | Nov. 22, 1922 | B 251 |
| Strang, Thomas | Oct. 31, 1912 | B 158 | | | |

THIRD-CLASS CERTIFICATES ISSUED UNDER "COAL-MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904."

| Name. | Date. | No. | Name. | Date. | No. |
|---|---|---|---|---|---|
| Adamson, Robert | May 1, 1909 | C 323 | Barrass, Robt. | June 30, 1926 | C 795 |
| Adamson, Wm. | Dec. 22, 1921 | C 721 | Bastian, Albert | May 30, 1923 | C 750 |
| Ainsworth, Edward | May 16, 1918 | C 674 | Bate, Horace | Dec. 30, 1926 | C 802 |
| Allan, Alexander | Oct. 28, 1911 | C 430 | Bateman, Joseph William | Oct. 28, 1913 | C 551 |
| Almond, Alex | Oct. 1, 1907 | C 252 | Bauld, Wm. | June 10, 1911 | C 422 |
| Almond, Walter | July 22, 1908 | C 286 | Baxter, Robert | Oct. 28, 1911 | C 450 |
| Alstead, Robt. | June 21, 1921 | C 719 | Baybutt, Thomas | May 27, 1913 | C 548 |
| Anderson, John | Oct. 28, 1911 | C 437 | Beard, Henry C. | May 30, 1923 | C 751 |
| Anderson, Peter Blane | Nov. 15, 1917 | C 660 | Beeton, D. H. | May 1, 1909 | C 338 |
| Anderson, Robt. | Oct. 14, 1914 | C 599 | Bell, Fred | May 27, 1913 | C 514 |
| Angell, William | May 21, 1914 | C 591 | Bell, John | May 9, 1912 | C 477 |
| Arbuckle, John | May 13, 1915 | C 622 | Bennett, Andrew M. | Nov. 15, 1917 | C 661 |
| Archibald, Geo. | May 21, 1914 | C 569 | Bennett, John | Oct. 14, 1914 | C 597 |
| Archibald, Thomas | Oct. 28, 1911 | C 454 | Bennie, John | June 10, 1911 | C 411 |
| Ball, Alfred | May 17, 1917 | C 635 | Beveridge, Wm. | June 10, 1911 | C 396 |
| Bann, Thomas | Oct. 31, 1912 | C 494 | Biggs, John | Mar. 4, 1905 | C 210 |
| Baggaley, J. | July 22, 1908 | C 300 | Biggs, Thomas | Oct. 28, 1911 | C 449 |
| Bain, James | May 27, 1913 | C 546 | Birchell, Richard | Oct. 1, 1907 | C 266 |
| Bainbridge, James | Nov. 21, 1922 | C 744 | Blair, James | Oct. 31, 1912 | C 502 |
| Ball, Benjamin | May 21, 1914 | C 583 | Blas, Emil | June 24, 1924 | C 774 |
| Barker, Robert | June 10, 1911 | C 415 | Blewett, Ernest | July 22, 1908 | C 298 |
| Barlow, B. R. | May 1, 1909 | C 337 | Blinkhorn, Thomas | Dec. 19, 1918 | C 681 |
| Barr, Samuel | June 10, 1927 | C 809 | Bond, Frank | June 30, 1926 | C 797 |

THIRD-CLASS CERTIFICATES ISSUED UNDER "COAL-MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904"—*Continued.*

| Name. | Date. | No. |
|---|---|---|
| Bradley, William | July 22, 1908 | C 291 |
| Bradley, Wilfred | May 17, 1922 | C 733 |
| Bridge, Edward | July 29, 1905 | C 223 |
| Briscoe, F. | July 22, 1908 | C 309 |
| Broderick, Matthew | Jan. 21, 1913 | C 525 |
| Brown, Arthur A. | Oct. 14, 1914 | C 596 |
| Brown, David | Nov. 1, 1909 | C 348 |
| Brown, George | July 8, 1916 | C 626 |
| Brown, George A. | Dec. 14, 1920 | C 706 |
| Brown, James | Sept. 10, 1910 | C 364 |
| Brown, James | June 10, 1911 | C 412 |
| Brown, James | July 8, 1916 | C 625 |
| Brown, Jas. Millie | May 13, 1915 | C 615 |
| Brown, John | Sept. 10, 1910 | C 392 |
| Brown, Robert | Oct. 28, 1911 | C 451 |
| Brown, Robert D. | June 10, 1911 | C 423 |
| Brown, Robert S. | June 10, 1911 | C 408 |
| Brown, Wm. A. | May 21, 1914 | C 576 |
| Brown, William Gold | July 8, 1916 | C 629 |
| Bruce, Preston | Dec. 14, 1920 | C 712 |
| Bullen, Thomas | Sept. 10, 1910 | C 379 |
| Bushell, Jas. P. | Oct. 1, 1907 | C 264 |
| Bysouth, Thomas | May 16, 1918 | C 673 |
| Cairns, Andrew | June 10, 1911 | C 420 |
| Cairns, Robert | May 27, 1913 | C 539 |
| Caldwell, Daniel | May 17, 1917 | C 639 |
| Caldwell, Peter | June 21, 1921 | C 715 |
| Calverly, Joseph | Sept. 10, 1910 | C 375 |
| Camamile, Hollis | Oct. 28, 1911 | C 443 |
| Campbell, Samuel | Nov. 15, 1917 | C 662 |
| Campbell, Andrew | Nov. 27, 1917 | C 651 |
| Carroll, George | Nov. 21, 1922 | C 746 |
| Carr, Peter | Oct. 31, 1912 | C 497 |
| Carson, George | Mar. 17, 1917 | C 663 |
| Cartwright, Wm. H. | June 24, 1924 | C 768 |
| Cass, Wm. | Dec. 30, 1926 | C 800 |
| Catchpole, Charles | July 29, 1905 | C 227 |
| Caufield, Edward | May 16, 1918 | C 670 |
| Caufield, John | May 1, 1909 | C 321 |
| Challoner, Arthur | Oct. 28, 1911 | C 433 |
| Chambers, Ralph H. | Dec. 14, 1920 | C 709 |
| Chapman, Wm. | Dec. 22, 1921 | C 720 |
| Chapman, John | May 30, 1923 | C 753 |
| Chapman, Thomas H. | Jan. 5, 1925 | C 779 |
| Charnock, John | Nov. 15, 1917 | C 653 |
| Cheetham, Ben | July 22, 1908 | C 311 |
| Chester, John | Oct. 28, 1911 | C 440 |
| Clark, Lewis | June 10, 1911 | C 405 |
| Clark, Walter Pattison | May 9, 1912 | C 480 |
| Clarkson, Robert | June 21, 1920 | C 696 |
| Clarkstone, Wm. W. | Oct. 28, 1911 | C 431 |
| Clarkstone, Hugh | May 17, 1922 | C 736 |
| Cleaves, Walter | May 9, 1912 | C 475 |
| Clifford, William | July 22, 1908 | C 313 |
| Cloke, Chas. E. | June 16, 1925 | C 782 |
| Coates, Frank | June 16, 1925 | C 789 |
| Colgrove, Charles Henry | Dec. 19, 1918 | C 679 |
| Commons, William | July 22, 1908 | C 304 |
| Coupland, David | June 21, 1921 | C 713 |
| Cooke, Joseph | Mar. 4, 1905 | C 209 |
| Coomb, Alexander | May 27, 1913 | C 533 |
| Cooper, John Andrew | Dec. 19, 1918 | C 689 |
| Cope, Frank | Oct. 28, 1913 | C 549 |
| Corbett, Garnet S. | Dec. 23, 1927 | C 812 |
| Coulthard, James | June 10, 1911 | C 407 |
| Crawford, David | Mar. 4, 1905 | C 208 |
| Cunningham, G. F. | Nov. 11, 1905 | C 229 |
| Cunliffe, Thos. | Oct. 1, 1907 | C 265 |
| Dabb, Owen | May 21, 1914 | C 578 |
| Dando, John | May 9, 1912 | C 465 |
| Davey, George | June 21, 1921 | C 718 |
| Davidson, Hugh | May 9, 1919 | C 464 |
| Davies, Alfred | Oct. 3, 1912 | C 691 |
| Davies, Evan Thomas | May 9, 1912 | C 463 |
| Davies, John H. C. | May 17, 1922 | C 729 |
| Davis, John David | May 16, 1918 | C 669 |
| Davis, William | May 1, 1909 | C 339 |
| Dean, Andrew | Dec. 19, 1918 | C 688 |
| Dean, Joseph | May 13, 1915 | C 611 |
| Derbyshire, A. | June 10, 1911 | C 401 |
| Dewar, Alex. | Sept. 10, 1910 | C 369 |
| Devlin, Edward | Oct. 23, 1906 | C 241 |
| Devlin, Ernest Henry | May 27, 1913 | C 538 |
| Devlin, John | Oct. 3, 1919 | C 693 |
| Devoy, William | May 17, 1917 | C 638 |
| Dickenson, Clifford | May 27, 1917 | C 532 |
| Dickie, Leslie | Nov. 20, 1923 | C 762 |
| Dingsdale, Geo. | Oct. 28, 1911 | C 459 |
| Dobie, Thomas | Dec. 22, 1921 | C 726 |
| Doherty, J. J. | May 1, 1909 | C 340 |
| Doney, John | Mar. 4, 1905 | C 211 |
| Donnachie, John | June 10, 1911 | C 425 |
| Doodson, Robert | Oct. 28, 1911 | C 455 |
| Dorrance, Orlin William | Jan. 21, 1913 | C 517 |
| Douglas, D. B. | Oct. 23, 1906 | C 235 |
| Dow, And. Y. | May 21, 1914 | C 587 |
| Drybrough, Robert | June 21, 1920 | C 701 |
| Dunn, Wm. | Oct. 14, 1914 | C 606 |
| Dunnigan, Richard | June 21, 1921 | C 716 |
| Dykes, Isaac | June 10, 1911 | C 409 |
| Dykes, Joseph W. | Oct. 1, 1907 | C 248 |
| Eccleston, Thomas | May 17, 1917 | C 482 |
| Eccleston, John I. | May 30, 1923 | C 757 |
| Edwards, John | May 27, 1913 | C 542 |
| Elliott, John | May 27, 1913 | C 541 |
| Elliott, John B. | Dec. 23, 1927 | C 811 |
| Elmes, George | Oct. 31, 1912 | C 511 |
| Evans, D. | July 22, 1908 | C 284 |
| Ewing, Robert | May 13, 1915 | C 608 |
| Fairfoull, James | Oct. 28, 1911 | C 453 |
| Farrow, John William | Dec. 19, 1918 | C 683 |
| Ferryman, Henry | June 21, 1920 | C 697 |
| Fitzpatrick, T. J. | Oct. 2, 1911 | C 452 |
| Flockart, David | Jan. 21, 1913 | C 531 |
| Ford, Allen | Oct. 28, 1911 | C 445 |
| Fowler, Robert | Oct. 31, 1912 | C 495 |
| Francis, David Morgan | Oct. 28, 1913 | C 558 |
| Francis, James | Oct. 1, 1907 | C 250 |
| Frater, George | May 13, 1915 | C 616 |
| Freeman, H. N. | Nov. 14, 1905 | C 230 |
| Frew, William M. | May 30, 1923 | C 752 |
| Frew, Andrew | Nov. 27, 1909 | C 360 |
| Frodsham, Vincent | July 22, 1908 | C 282 |
| Furbow, John | Jan. 21, 1913 | C 528 |
| Gabriel, Ernest P. | May 17, 1922 | C 739 |
| Garbett, Richard | Sept. 10, 1910 | C 377 |
| Gascoyne, Rowland B. | Jan. 21, 1913 | C 513 |
| Geater, Jas. Gordon | May 21, 1914 | C 573 |
| Gemmell, James | Oct. 31, 1912 | C 505 |
| Gillham, John | May 13, 1915 | C 623 |

THIRD-CLASS CERTIFICATES ISSUED UNDER "COAL-MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904"—*Continued.*

| Name. | Date. | No. | Name. | Date. | No. |
|---|---|---|---|---|---|
| Gillies, William | May 16, 1918 | C 668 | Johnson, Moses | Oct. 1, 1907 | C 258 |
| Glenn, James | Oct. 28, 1911 | C 435 | Johnston, Fred | Dec. 30, 1926 | C 803 |
| Gordon, Davis John | May 9, 1912 | C 474 | Johnston, Robert | May 9, 1912 | C 479 |
| Gourley, Robert | May 9, 1912 | C 470 | Jones, Alf. Geo. | May 21, 1914 | C 584 |
| Gray, George | May 9, 1912 | C 467 | Jones, Samuel | May 27, 1913 | C 518 |
| Gregory, William | May 30, 1923 | C 756 | Jones, William C. | Jan. 21, 1913 | C 556 |
| Gregson, John B. | Dec. 31, 1925 | C 790 | Jones, William Ernest | Oct. 28, 1913 | C 221 |
| Green, William | Nov. 15, 1917 | C 659 | Jones, W. T. | Mar. 4, 1905 | C 544 |
| Greenhorn, John | May 21, 1914 | C 575 | Joyce, Walter | Nov. 27, 1909 | C 361 |
| Groat, Ed. Murray | Nov. 20, 1923 | C 764 | Judge, Peter | Sept. 10, 1910 | C 391 |
| Griffiths, Edward | Oct. 31, 1914 | C 508 | Keenan, Wm. James | June 10, 1911 | C 426 |
| Gunniss, Matthew | May 9, 1912 | C 460 | Kelly, Ernest | May 17, 1917 | C 646 |
| Haile, Joseph G. | May 17, 1922 | C 731 | Kemp, Wm. | Oct. 14, 1914 | C 594 |
| Hallinan, William | May 1, 1909 | C 343 | Kingham, Alfred | Oct. 28, 1913 | C 559 |
| Hall, Joseph | May 17, 1922 | C 742 | Kirkeberg, H. S. | Nov. 27, 1909 | C 350 |
| Halsall, J. | July 22, 1908 | C 307 | Klejko, Steve | Dec. 14, 1920 | C 703 |
| Hamilton, John | Oct. 28, 1911 | C 444 | Lane, Joseph | Oct. 1, 1907 | C 254 |
| Hamilton, Robert Nesbitt | Oct. 28, 1913 | C 550 | Lavin, Joseph | June 21, 1920 | C 700 |
| Hampton, Samuel | Nov. 15, 1917 | C 650 | Leeman, T. | May 1, 1909 | C 345 |
| Hancock, Arthur | Nov. 15, 1917 | C 656 | Lester, Frank | May 17, 1922 | C 734 |
| Hardy, Edward | June 21, 1920 | C 694 | Lewis, Benj. J. | Sept. 10, 1910 | C 386 |
| Hartley, Thomas | Oct. 31, 1912 | C 510 | Leynard, Paul | May 17, 1917 | C 637 |
| Hart, Daniel M. | May 17, 1922 | C 730 | Liddle, John | July 29, 1905 | C 228 |
| Harwood, Fred | Sept. 10, 1910 | C 384 | Lindsay, William | May 17, 1917 | C 642 |
| Harvey, Thomas | May 9, 1912 | C 466 | Linn, George Y. | May 17, 1922 | C 737 |
| Harvie, George | Sept. 10, 1910 | C 378 | Littler, James | June 30, 1926 | C 792 |
| Heaps, Robert | Sept. 10, 1910 | C 373 | Littler, John | June 10, 1911 | C 410 |
| Hemer, Herbert | Oct. 14, 1914 | C 595 | Littler, Matthew | June 10, 1911 | C 417 |
| Henney, Jonathan | June 10, 1911 | C 424 | Littler, Robert | June 10, 1911 | C 418 |
| Hendry, James | May 9, 1912 | C 471 | Livingstone, Alex | Oct. 28, 1911 | C 436 |
| Herd, William | Dec. 19, 1918 | C 682 | Loxton, George | June 10, 1911 | C 428 |
| Heyes, Edward | May 1, 1909 | C 320 | Loxton, John | June 10, 1911 | C 416 |
| Hilton, Mathias | Dec. 19, 1918 | C 677 | Lloyd, Thomas | May 17, 1922 | C 740 |
| Hilton, R. G. | Sept. 10, 1910 | C 376 | Luck, George | May 1, 1909 | C 318 |
| Hindmarsh, John G. | June 30, 1926 | C 799 | Lynch, Stewart | Oct. 28, 1911 | C 432 |
| Hindmarsh, Peter | May 30, 1923 | C 755 | Mackie, John | June 10, 1911 | C 421 |
| Hodson, R. H. | Mar. 4, 1905 | C 216 | Makin, J. Wm. | Sept. 10, 1910 | C 385 |
| Hodge, William K. | Nov. 20, 1923 | C 761 | Malone, John | May 21, 1914 | C 585 |
| Holdsworth, William | May 16, 1918 | C 671 | Maltman, James | Oct. 31, 1912 | C 501 |
| Holliday, William | July 8, 1916 | C 634 | Mansfield, A. | May 1, 1909 | C 336 |
| Hopkins, Harry | Dec. 31, 1925 | C 791 | Marrs, John | May 17, 1917 | C 640 |
| Horbury, Joseph W. | June 10, 1911 | C 406 | Marsh, Daniel Parks | May 27, 1913 | C 543 |
| Horrocks, A. G. | May 1, 1909 | C 324 | Marsh, John | Oct. 1, 1907 | C 270 |
| Horwood, S. | July 22, 1908 | C 312 | Martin, James | June 10, 1911 | C 398 |
| Houston, Robert | July 8, 1916 | C 631 | Mason, Joseph | July 22, 1908 | C 297 |
| Howells, Nathaniel | May 1, 1909 | C 316 | Massey, Henry | May 1, 1909 | C 317 |
| Hunter, Peter M. | June 30, 1926 | C 798 | Mather, Thomas | July 22, 1908 | C 293 |
| Hunter, Thomas | June 16, 1925 | C 786 | Matusky, Andrew | Oct. 1, 1907 | C 259 |
| Hutchison, Ben | Nov. 14, 1905 | C 232 | Mawson, J. T. | Nov. 27, 1909 | C 359 |
| Hutchison, Fred | Nov. 27, 1909 | C 358 | Maxwell, Geo. | May 21, 1914 | C 571 |
| Hynd, John | Dec. 14, 1920 | C 707 | McAlpine, John | Mar. 4, 1905 | C 217 |
| Hynds, William | July 8, 1916 | C 632 | McArthur, John Malcolm | May 17, 1917 | C 648 |
| Ireson, John | Oct. 31, 1912 | C 507 | McArthur, Robert | Dec. 22, 1921 | C 723 |
| Irvine, David | June 10, 1911 | C 413 | McBroom, Al. | July 2, 1908 | C 287 |
| Jack, John | May 21, 1914 | C 582 | McCourt, John | Oct. 14, 1914 | C 605 |
| Jackson, Harry | June 24, 1924 | C 776 | McCourt, Thos. | Dec. 30, 1926 | C 805 |
| James, Thos. | May 21, 1914 | C 588 | McCulloch, James | May 1, 1909 | C 315 |
| Jardine, Geo. Edward | Jan. 21, 1913 | C 521 | McDonald, John | Oct. 28, 1911 | C 448 |
| Jarrett, Fred. J. | Oct. 1, 1907 | C 256 | McFagen, Alexander | May 9, 1912 | C 490 |
| Jaynes, Frank | July 22, 1908 | C 277 | McFegan, Robert | June 21, 1920 | C 698 |
| Jemson, J. W. | Mar. 4, 1905 | C 205 | McFegan, W. | May 1, 1909 | C 319 |
| Jenkins, John | Sept. 10, 1910 | C 390 | McGarry, Martin | May 1, 1909 | C 326 |
| Jenkinson, Jonathan | Dec. 23, 1927 | C 813 | McGrath, James | July 8, 1916 | C 630 |
| John, Howel | July 22, 1908 | C 305 | McGuckie, Jno. M. | May 21, 1914 | C 562 |

THIRD-CLASS CERTIFICATES ISSUED UNDER "COAL-MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904"—*Continued.*

| Name. | Date. | No. |
|---|---|---|
| McGuckie, Thomas | July 29, 1905 | C 226 |
| McGuire, Thomas | Oct. 28, 1913 | C 553 |
| McIntyre, Neil | May 21, 1914 | C 574 |
| McKay, Walter | Nov. 20, 1923 | C 763 |
| McKelvie, J. | July 22, 1908 | C 285 |
| McKenzie, Peter | June 10, 1911 | C 427 |
| McKibben, Matthew | May 21, 1914 | C 580 |
| McKinley, John | Oct. 28, 1914 | C 442 |
| McLaren, John | May 30, 1923 | C 754 |
| McLaughlin, James | May 9, 1912 | C 485 |
| McLachlan, Alex | June 10, 1912 | C 419 |
| McLean, M. D. | Sept. 10, 1910 | C 389 |
| McLellan, William | Mar. 4, 1905 | C 219 |
| McLeod, James | July 22, 1908 | C 296 |
| McLeod, John | May 13, 1915 | C 609 |
| McMeakin, James | May 13, 1915 | C 612 |
| McMillan, D. | Sept. 10, 1910 | C 363 |
| McMillan, Edward | Oct. 31, 1912 | C 493 |
| McMillan, Neil | Nov. 15, 1917 | C 654 |
| McNay, Carmichael | July 22, 1908 | C 306 |
| McNeill, Adam L. | July 22, 1908 | C 281 |
| McNeill, Robert | Sept. 10, 1910 | C 387 |
| McWhirter, Archibald | June 30, 1926 | C 794 |
| Meek, Matthew | May 9, 1912 | C 484 |
| Meikle, Harry Alexander | July 8, 1916 | C 627 |
| Menzies, Frederick | Dec. 14, 1920 | C 704 |
| Merrifield, George | Oct. 23, 1906 | C 239 |
| Merrifield, William | Oct. 23, 1906 | C 236 |
| Michek, John | May 21, 1914 | C 563 |
| Miles, John | June 10, 1911 | C 414 |
| Mitchell, Charles | May 1, 1909 | C 322 |
| Mitchell, Henry | Sept. 10, 1910 | C 366 |
| Monks, James | Nov. 14, 1905 | C 234 |
| Moore, George | Oct. 23, 1906 | C 242 |
| Moore, John | May 1, 1909 | C 335 |
| Moreland, Thomas | July 22, 1908 | C 299 |
| Morgan, John | July 29, 1905 | C 224 |
| Morgan, William | May 17, 1917 | C 636 |
| Morgan, Cornelius | Dec. 22, 1921 | C 725 |
| Morgan, John | June 24, 1924 | C 773 |
| Morris, David | May 9, 1912 | C 472 |
| Mottishaw, Samuel K. | Oct. 23, 1906 | C 237 |
| Murdock, Jno. Y. | May 21, 1914 | C 564 |
| Murray, Robt. | June 30, 1926 | C 796 |
| Myers, Peter | Oct. 28, 1911 | C 446 |
| Nanson, T. H. | July 22, 1908 | C 280 |
| Nash, George William | May 17, 1917 | C 565 |
| Nash, George F. | Dec. 22, 1921 | C 727 |
| Nee, Wm. R. | Dec. 22, 1921 | C 724 |
| Neen, Joseph | Nov. 27, 1909 | C 352 |
| Nelson, Horatio | Oct. 1, 1907 | C 263 |
| Neilson, William | May 9, 1912 | C 481 |
| Newman, John | Oct. 14, 1914 | C 603 |
| Nicholson, James | May 9, 1912 | C 469 |
| Nimmo, James | May 9, 1912 | C 461 |
| Norris, Joshua | Oct. 28, 1913 | C 557 |
| Nuttall, Wm. | June 16, 1925 | C 780 |
| Oakes, Robert | Oct. 31, 1912 | C 498 |
| O'Brien, Charles | Nov. 27, 1909 | C 349 |
| Odgers, Eli | Jan. 21, 1913 | C 523 |
| Orr, Alexander | Oct. 28, 1911 | C 434 |
| Osborne, Hugh | Oct. 28, 1913 | C 555 |
| Oswald, Geo. L. | Sept. 10, 1910 | C 370 |
| Owen, Thomas | May 1, 1909 | C 347 |
| Park, William | Dec. 19, 1918 | C 684 |
| Parks, Alexander | Jan. 21, 1913 | C 519 |
| Parker, L. | May 1, 1909 | C 341 |
| Parkinson, James Wm. | Nov. 15, 1917 | C 655 |
| Parkinson, T. | July 22, 1908 | C 289 |
| Parkinson, Thomas | June 24, 1924 | C 769 |
| Parrott, Jas. E. | May 21, 1914 | C 590 |
| Parson, Herbert | May 13, 1915 | C 621 |
| Parsons, Albert | June 10, 1927 | C 808 |
| Pearson, Jonathan | May 9, 1912 | C 473 |
| Penman, Hugh | Oct. 28, 1913 | C 552 |
| Perry, Geo. Harewood | May 17, 1917 | C 643 |
| Phillips, Richard S. | May 17, 1917 | C 620 |
| Phillips, James | Nov. 21, 1922 | C 749 |
| Pickup, A. | July 22, 1908 | C 310 |
| Picton, W. | May 1, 1909 | C 333 |
| Plank, Samuel | Nov. 14, 1905 | C 233 |
| Pollock, John | May 30, 1923 | C 760 |
| Poole, Samuel | May 27, 1913 | C 536 |
| Price, Walter | Sept. 10, 1910 | C 371 |
| Puckey, John Thomas | Dec. 19, 1918 | C 687 |
| Quayle, Alex. B. | Jan. 5, 1925 | C 778 |
| Quinn, James | Oct. 28, 1911 | C 441 |
| Quinn, John | Oct. 28, 1911 | C 429 |
| Radford, Albert | May 21, 1914 | C 579 |
| Rallison, R. | July 22, 1908 | C 279 |
| Rallison, James | May 30, 1923 | C 759 |
| Rankin, George | July 22, 1908 | C 275 |
| Rankin, Wm. Shaw | May 9, 1912 | C 489 |
| Raynor, Fred | Oct. 1, 1907 | C 257 |
| Rear, Albert E. | June 10, 1927 | C 807 |
| Reid, Robert | Sept. 10, 1910 | C 383 |
| Reid, Thos. | May 21, 1914 | C 592 |
| Reid, Wm. | June 10, 1911 | C 403 |
| Reilly, Thomas | July 22, 1908 | C 303 |
| Renney, Jas. | Nov. 27, 1909 | C 354 |
| Richards, James | Nov. 1, 1907 | C 249 |
| Richards, Samuel | Oct. 23, 1906 | C 244 |
| Richardson, J. H. | Oct. 28, 1911 | C 458 |
| Rigby, John | July 29, 1905 | C 225 |
| Roberts, Arthur | June 24, 1924 | C 772 |
| Roberts, Ebenezer | May 1, 1909 | C 327 |
| Robinson, Michael | May 1, 1909 | C 332 |
| Robinson, Asa | June 16, 1925 | C 787 |
| Robson, James | June 16, 1925 | C 788 |
| Robson, Thomas | May 21, 1914 | C 566 |
| Rogers, Ellis | May 13, 1915 | C 624 |
| Roper, William | July 22, 1908 | C 274 |
| Ross, William | June 21, 1920 | C 702 |
| Rowan, Alexander | Oct. 31, 1912 | C 500 |
| Rowan, John | Oct. 14, 1914 | C 602 |
| Rowbottom, Thomas | Oct. 31, 1914 | C 492 |
| Royle, Edward | Oct. 31, 1912 | C 506 |
| Russell, Robert | Nov. 27, 1909 | C 351 |
| Rutherford, Jasper | May 17, 1917 | C 644 |
| Rutledge, Edwin | July 22, 1908 | C 302 |
| Scales, Joseph | May 17, 1922 | C 738 |
| Scott, Henry | July 22, 1908 | C 294 |
| Saunders, Eustace L. | Jan. 21, 1913 | C 520 |
| Scarpino, Francis | May 17, 1917 | C 649 |
| Seddon, James | Oct. 3, 1919 | C 692 |
| Shanks, David | Sept. 10, 1910 | C 372 |

THIRD-CLASS CERTIFICATES ISSUED UNDER "COAL-MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904"—*Continued.*

| Name. | Date. | No. | Name. | Date. | No. |
|---|---|---|---|---|---|
| Sharp, James | May 1, 1909 | C 325 | Thomas, Warriett | Oct. 1, 1907 | C 273 |
| Sharpe, Henry | June 16, 1925 | C 783 | Thomason, Charles | Nov. 15, 1917 | C 657 |
| Sharples, J. T. | Sept. 10, 1910 | C 380 | Thompson, Charles | June 24, 1924 | C 765 |
| Shea, Thomas J. | Dec. 22, 1921 | C 722 | Thompson, Thomas | Oct. 1, 1917 | C 267 |
| Shearer, L. | May 1, 1909 | C 330 | Thompson, John | Oct. 31, 1912 | C 509 |
| Shields, Thomas | May 16, 1918 | C 667 | Thompson, Joseph | Oct. 1, 1907 | C 269 |
| Shipley, John W. | Oct. 28, 1911 | C 456 | Thomson, Duncan | Mar. 4, 1905 | C 218 |
| Shooter, Joseph | Oct. 1, 1907 | C 261 | Tolley, John | Dec. 19, 1918 | C 678 |
| Shortman, J. | May 1, 1909 | C 331 | Touhey, William | May 27, 1913 | C 547 |
| Simister, J. H. | Nov. 27, 1909 | C 353 | Travis, Joseph | June 21, 1920 | C 699 |
| Simister, W. | May 1, 1909 | C 334 | Tully, Thomas | May 9, 1912 | C 468 |
| Sim, James | Dec. 14, 1920 | C 711 | Tune, Elijah | May 9, 1912 | C 476 |
| Simms, Hubert Allan | Jan. 21, 1913 | C 526 | Unsworth, John | June 16, 1925 | C 784 |
| Sinclair, William | Jan. 21, 1913 | C 527 | Vardy, Robt. | May 21, 1914 | C 570 |
| Skelton, Thos. | May 1, 1909 | C 344 | Vaughan, John Henry | Oct. 28, 1913 | C 560 |
| Slee, Thomas | June 30, 1926 | C 793 | Vincent, Thomas C. | Nov. 21, 1922 | C 745 |
| Smith, A. E. | Sept. 10, 1910 | C 367 | Waddington, D. M. | June 10, 1927 | C 806 |
| Smellie, John | May 29, 1923 | C 755 | Walker, George | July 8, 1916 | C 633 |
| Smith, John Watterson | May 16, 1918 | C 665 | Walker, Jas. Alexander | Oct. 31, 1912 | C 496 |
| Smith, Joseph | Mar. 4, 1905 | C 207 | Walker, Robert C. | May 17, 1922 | C 728 |
| Smith, Richard Beveridge | Oct. 28, 1913 | C 561 | Walker, Wm. | May 21, 1914 | C 586 |
| Smith, Thomas | Dec. 30, 1926 | C 804 | Wallace, Fred | Oct. 1, 1907 | C 260 |
| Smith, Thos. J. | Oct. 1, 1907 | C 271 | Walls, John | Dec. 14, 1920 | C 710 |
| Smith, Thomas | May 9, 1912 | C 486 | Warburton, Ernest L. | June 10, 1911 | C 399 |
| Smith, Thomas | Dec. 14, 1920 | C 705 | Ward, Ernest Hedley | May 17, 1917 | C 641 |
| Snow, Aubrey | June 15, 1918 | C 675 | Wardrop, James | Oct. 31, 1912 | C 504 |
| Sopwith, Reginald Scott | Jan. 21, 1913 | C 512 | Watson, Adam G. | Mar. 4, 1905 | C 212 |
| *Sparks, Edward | Oct. 1, 1907 | C 255 | Watson, Arthur W. | May 27, 1913 | C 535 |
| Spencer, G. | May 1, 1909 | C 329 | Watson, George | July 22, 1908 | C 288 |
| Spruston, R. L. | Nov. 27, 1909 | C 355 | Watson, Joseph | Jan. 21, 1913 | C 515 |
| Spruston, Thomas A. | Mar. 4, 1905 | C 206 | Watson, William | Oct. 22, 1906 | C 246 |
| Stafford, M. | Sept. 10, 1910 | C 382 | Watson, William | May 17, 1917 | C 645 |
| Starr, Wallace | May 9, 1912 | C 488 | Watson, John | May 17, 1922 | C 743 |
| Staton, Edward | May 21, 1914 | C 581 | Weaver, William | Nov. 17, 1922 | C 748 |
| Steele, Walter | Oct. 28, 1911 | C 439 | Webb, Herbert | Oct. 28, 1911 | C 457 |
| Stewart, George | May 27, 1913 | C 534 | Webster, James Stewart | Dec. 19, 1918 | C 685 |
| Stewart, James M. | Oct. 23, 1906 | C 240 | Weeks, John | Mar. 4, 1905 | C 214 |
| Stewart, James B. | June 16, 1925 | C 785 | West, James Gloag | May 16, 1918 | C 676 |
| Stewart, John | Dec. 30, 1926 | C 801 | Whalley, William | Dec. 19, 1918 | C 686 |
| Stobbart, David | June 16, 1925 | C 781 | White, James | Oct. 31, 1912 | C 499 |
| Stockwell, William | Oct. 23, 1906 | C 238 | White, John | Oct. 22, 1906 | C 245 |
| Stone, Wm. C. | June 21, 1921 | C 714 | Wilkinson, Edward | Oct. 28, 1911 | C 438 |
| Strachan, John | Oct. 14, 1914 | C 604 | Williams, John Sam. | June 10, 1911 | C 404 |
| Strang, James | May 13, 1915 | C 614 | Williams, Watkin | June 22, 1908 | C 301 |
| Strang, Thomas | June 10, 1911 | C 400 | Wilson, Joseph | June 24, 1924 | C 767 |
| Strang, Wm. | June 10, 1911 | C 395 | Wilson, Robinson | June 10, 1911 | C 397 |
| Strang, William L. | Jan. 5, 1925 | C 777 | Wilson, Thomas M. | Oct. 1, 1907 | C 272 |
| Sutherland, John | May 27, 1913 | C 545 | Wilson, William | Oct. 1, 1907 | C 262 |
| Sweeney, John | May 17, 1922 | C 735 | Wilson, William | May 17, 1917 | C 674 |
| Taylor, Charles M. | Mar. 4, 1905 | C 213 | Winstanley, Robert | Nov. 21, 1922 | C 747 |
| Taylor, Hugh | Jan. 21, 1913 | C 530 | Winstanley, Oliver | May 17, 1922 | C 741 |
| Taylor, James | May 21, 1914 | C 567 | Winstanley, H. | July 22, 1908 | C 283 |
| Taylor, Jonathan | Dec. 19, 1918 | C 680 | Wintle, Thomas A. | July 29, 1905 | C 222 |
| Taylor, J. T. | Oct. 28, 1911 | C 447 | Witherington, George | Oct. 28, 1913 | C 554 |
| Taylor, Leroy | Sept. 10, 1910 | C 381 | Wood, Thos. James | Oct. 31, 1912 | C 491 |
| Taylor, Robert | June 21, 1920 | C 695 | Worthington, J. | July 22, 1908 | C 295 |
| Taylor, Thomas | May 21, 1914 | C 577 | Wright, John | May 21, 1914 | C 593 |
| Tennant, Joseph | June 24, 1924 | C 770 | Wright, Robert | May 21, 1914 | C 589 |
| Thacker, Geo. | May 27, 1913 | C 537 | Wright, William | Jan. 21, 1913 | C 522 |
| Thomas, Thomas | Sept. 10, 1910 | C 365 | Yates, Frank | May 17, 1922 | C 732 |
| Thomas, John B. | Nov. 14, 1905 | C 231 | Yeowart, Hudson | June 24, 1924 | C 771 |
| Thomas, Joseph | Mar. 4, 1905 | C 220 | Young, Alexander | May 16, 1918 | C 666 |

* C 314 issued in lieu of C 255 destroyed by Fernie fire.

## COAL-MINE OFFICIALS.

Third-class Certificates issued under "Coal-mines Regulation Act Further Amendment Act, 1904," sec. 38, subsec. (2), in exchange for Certificates issued under the "Coal-mines Regulation Act Amendment Act, 1901."

| Name. | Date. | No. | Name. | Date. | No. |
|---|---|---|---|---|---|
| Adam, Robert | Oct. 12, 1904 | C 42 | Lanfear, Herbert | Jan. 27, 1905 | C 63 |
| Addison, Thos. | Dec. 10, 1904 | C 52 | Lewis, Thos. | Oct. 11, 1904 | C 35 |
| Aitken, James | Oct. 24, 1904 | C 44 | Marsden, John | May 3, 1904 | C 21 |
| Allsop, Harry | Oct. 11, 1904 | C 34 | Miard, Harry E. | Mar. 3, 1905 | C 76 |
| Ashman, Jabez | Feb. 5, 1907 | C 131 | Middleton, Robt. | Feb. 11, 1905 | C 71 |
| Auchinvole, Alex | Mar. 29, 1905 | C 89 | Miller, Thos. K. | Feb. 21, 1905 | C 74 |
| Barclay, Andrew | April 27, 1904 | C 19 | McKenzie, John R. | Oct. 12, 1904 | C 40 |
| Barclay, James | April 27, 1904 | C 20 | McKinnon, Arch'd | April 3, 1905 | C 102 |
| Barclay, John | April 17, 1905 | C 111 | McMillan, Peter | Mar. 29, 1905 | C 94 |
| Bickle, Thos. | Oct. 11, 1904 | C 37 | McMurtrie, John | Mar. 29, 1905 | C 96 |
| Bowie, James | May 13, 1905 | C 116 | Moore, Wm. H. | June 17, 1905 | C 119 |
| Briscoe, Edward | Oct. 10, 1906 | C 129 | Morris, John | Dec. 27, 1904 | C 57 |
| Campbell, Dan | Mar. 29, 1905 | C 93 | Myles, Walter | April 3, 1905 | C 100 |
| Carr, Jos. E. | Oct. 11, 1904 | C 36 | Nash, Isaac | June 1, 1904 | C 120 |
| Carroll, Harry | Mar. 29, 1905 | C 98 | Neave, Wm. | Oct. 12, 1904 | C 43 |
| Clarkson, Alexander | April 27, 1904 | C 18 | Nelson, James | April 27, 1904 | C 16 |
| Collishaw, John | Feb. 7, 1905 | C 68 | Nimmo, Richard E. | April 18, 1911 | C 133 |
| Comb, John | Mar. 23, 1904 | C 2 | O'Brien, Geo. | Feb. 6, 1905 | C 66 |
| Courtney, A. W. | Nov. 2, 1904 | C 45 | Pearse, Thomas W. H. | April 14, 1916 | C 138 |
| Crawford, Frank | April 6, 1904 | C 7 | Power, John | Sept. 8, 1920 | C 142 |
| Daniels, David | April 27, 1904 | C 12 | Price, Jas. | Nov. 8, 1904 | C 50 |
| Davidson, David | April 3, 1905 | C 106 | Rafter, Wm. | Mar. 29, 1905 | C 95 |
| Davidson, John | Mar. 29, 1905 | C 87 | Reid, James | Mar. 23, 1904 | C 1 |
| Dobbie, John | Nov. 27, 1905 | C 126 | Richards, Thos. | April 27, 1904 | C 14 |
| Dudley, James | Mar. 22, 1905 | C 114 | Roughead, George | Jan. 30, 1907 | C 130 |
| Duncan, Thomas | Aug. 29, 1906 | C 128 | Ryan, John | Dec. 28, 1904 | C 59 |
| Dunlap, Henry | Nov. 21, 1904 | C 51 | Sanders, John W. | April 3, 1905 | C 107 |
| Dunn, Geo. | Dec. 19, 1904 | C 56 | Shenton, Thos. J. | July 25, 1904 | C 30 |
| Dunsmuir, John | Mar. 29, 1905 | C 90 | Shepherd, Henry | June 13, 1904 | C 26 |
| Eccleston, Wm. | Mar. 15, 1905 | C 80 | Smith, Geo. | Mar. 29, 1905 | C 84 |
| Fagan, David | April 6, 1905 | C 109 | Somerville, Alex. | Mar. 24, 1904 | C 3 |
| Farquharson, John | April 27, 1904 | C 17 | Stauss, Chas. F. | Feb. 9, 1905 | C 69 |
| Findlayson, James | June 6, 1904 | C 25 | Steele, Jas. | Mar. 29, 1905 | C 92 |
| Fulton, Hugh T. | April 3, 1905 | C 105 | Steele, John | June 4, 1913 | C 4 |
| Gibson, Edward | May 30, 1905 | C 118 | Stewart, Duncan H. | Mar. 28, 1904 | C 137 |
| Gilchrist, Wm. | Mar. 29, 1905 | C 85 | Stewart, John | April 3, 1904 | C 104 |
| Gillespie, Hugh | April 6, 1904 | C 8 | Stewart, Daniel W. | May 16, 1904 | C 23 |
| Gillespie, John | April 6, 1904 | C 5 | Stoddart, Jacob | Feb. 21, 1905 | C 73 |
| Gould, Alfred | April 17, 1906 | C 112 | Strachan, Robt. | April 27, 1904 | C 15 |
| Green, Francis | Oct. 11, 1904 | C 38 | Strang, James | April 27, 1904 | C 10 |
| Handlen, Jas. | June 16, 1904 | C 122 | Sullivan, John | July 4, 1916 | C 139 |
| Harmison, Wm. | Feb. 3, 1905 | C 65 | Summers, Joseph | May 17, 1920 | C 141 |
| Hescott, John | Jan. 16, 1905 | C 62 | Thomas, John | Mar. 29, 1905 | C 97 |
| Hoggan, Wm. | June 6, 1911 | C 134 | Vass, Robt. | Dec. 12, 1904 | C 53 |
| John, David | Nov. 8, 1904 | C 49 | Vater, Charles | April 6, 1904 | C 66 |
| *John, Evan | July 25, 1916 | C 140 | Webber, Chas. | Sept. 13, 1904 | C 32 |
| Johnson, Geo. | May 9, 1904 | C 124 | Whiting, Geo. | May 29, 1905 | C 117 |
| Johnson, Wm. R. | Mar. 1, 1905 | C 75 | Wilson, Austin | Feb. 7, 1905 | C 67 |
| Jones, Evan | April 30, 1913 | C 136 | Wilson, Thos. | April 27, 1904 | C 11 |
| Lander, Frank | Jan. 9, 1905 | C 61 | Woodburn, Moses | Mar. 29, 1905 | C 83 |

MINE SURVEYOR CERTIFICATES ISSUED UNDER THE "COAL-MINES REGULATION ACT AMENDMENT ACT, 1919."

| Name. | Date. | No. | Name. | Date. | No. |
|---|---|---|---|---|---|
| Anderson, Harry C. | May 19, 1922 | 59 | MacDonald, John | May 19, 1922 | 46 |
| Baile, Wynne Jeffreys | Oct. 3, 1919 | 16 | McKenzie, Frank | June 10, 1927 | 66 |
| Bonar, Robert B. | Dec. 30, 1926 | 64 | Miard, Harry Ernest | Oct. 3, 1919 | 2 |
| Bowerman, Everard S. | Dec. 14, 1920 | 39 | McCulloch, Robert | Oct. 3, 1919 | 6 |
| Boyce, Joseph Patrick | Oct. 3, 1919 | 5 | Owen, Wm. Arthur | Oct. 3, 1919 | 10 |
| Caufield, Bernard | May 19, 1922 | 54 | Priest, Elijah | May 19, 1922 | 53 |
| Corbett, Garnett S. | May 19, 1922 | 49 | Rafter, Wm. | May 19, 1922 | 51 |
| Cox, Richard | May 19, 1922 | 57 | Reger, Frederick Wm. | Oct. 3, 1919 | 7 |
| Crosscombe, James S. | May 31, 1923 | 60 | Richards, Chas. Clifton | Oct. 3, 1919 | 19 |
| Daniell, Geo. W. B. | Oct. 3, 1919 | 29 | Ridley, James | Oct. 3, 1919 | 18 |
| Davis, Gerald D. | Oct. 3, 1919 | 28 | Roaf, Jos. R. | Oct. 3, 1919 | 14 |
| Delaney, James | Oct. 3, 1919 | 21 | Richards, James A. | Oct. 3, 1919 | 15 |
| Dickson, James | Oct. 3, 1919 | 3 | Scott, Thos. Wright | Oct. 3, 1919 | 4 |
| Drewry, Wm. Stewart | May 19, 1922 | 56 | Strachan, Robert | June 21, 1920 | 36 |
| Edwards, Jas. | June 10, 1927 | 65 | Spruston, Thos. A. | May 19, 1922 | 52 |
| Freeman, Harry N. | May 19, 1922 | 49 | Strachan, Robert | May 19, 1922 | 45 |
| Garman, Maurice W. | Oct. 3, 1919 | 11 | Sandland, Joseph | May 31, 1923 | 61 |
| Gregory, P. W. | Nov. 17, 1919 | 32 | Stewart, R. T. | Nov. 17, 1923 | 62 |
| Graham, Charles | May 19, 1922 | 50 | Townsend, Neville F. | Nov. 17, 1919 | 31 |
| George, Frank J. | May 19, 1922 | 48 | Vallance, Wm. Dixon | Oct. 3, 1919 | 8 |
| Hargreaves, James | Nov. 29, 1920 | 33 | Verkirk, Lucas | June 21, 1921 | 42 |
| Hepburn, James T. | Dec. 14, 1920 | 37 | Waddington, Geo. W. | June 21, 1920 | 35 |
| Holdsworth, William | Oct. 3, 1919 | 9 | Wark, Samuel David | Oct. 3, 1919 | 20 |
| Hughes, Edward | Dec. 14. 1920 | 38 | White, Harold | Oct. 3, 1919 | 25 |
| Hunter, George | Oct. 3, 1919 | 30 | Wilson, R. Robinson | Oct. 3, 1919 | 12 |
| Howden, Archibald | May 19, 1922 | 55 | Wilson, Arthur Rupert | Oct. 3, 1919 | 13 |
| Jackson, Thos. R. | May 19, 1922 | 43 | Wilson, Chas. Jas. | Oct. 3, 1919 | 22 |
| King, Alfred Geo. | Oct. 3, 1919 | 27 | Wilson, Hartley Paul | Oct. 3, 1919 | 24 |
| Lancaster, Peter | Oct. 3, 1919 | 23 | Wilton, Douglas D. | May 19, 1922 | 59 |
| Lauderbach, Wilfrid P. | June 16, 1925 | 63 | Wilkie, Octavius B. N. | Oct. 3, 1919 | 26 |
| Lindoe, Luke | June 21, 1921 | 41 | Wright, Austin | Dec. 14, 1920 | 40 |
| Lymn, Albert Crompton | Oct. 3, 1919 | 17 | | | |

## PROSECUTIONS UNDER "COAL-MINES REGULATION ACT."

| Mine and Date. | Occupation of Defendant. | Offence charged. | Judgment. |
|---|---|---|---|
| Crow's Nest Pass Coal Co. Ltd.— | | | |
| Michel Colliery, May 25 | Miner | Stealing tools in mine | $10 and costs. |
| Michel Colliery, May 25 | Miner | Stealing tools in mine | $10 and costs. |
| Michel Colliery, June 6 | Miner | Failing to sprag coal | $10 and costs. |
| Michel Colliery, June 6 | Miner | Failing to sprag coal | $10 and costs. |
| Coal Creek, April 7 | Miner. | Cruelty to horse underground. | $50 and costs. |
| Canadian Collieries (D.), Ltd.— | | | |
| No. 1 Extension mine, Oct. 25 | Miner | Failing to sprag overhanging coal | $10 and costs. |
| No. 4 Comox mine, March 18 | Miner | Failing to timber his place | $10 and costs. |
| Western Fuel Corporation, Ltd.— | | | |
| No. 1 mine, March 12 | Miner's helper | Had matches in mine | $10 and costs. |
| Canadian National Anthracite Syndicate— | | | |
| Seaton mine, Oct. 28 | Superintendent | Had open lights in mine | $1 and costs. |

# METALLIFEROUS MINES SHIPPING IN 1927.

## NORTH-WESTERN DISTRICT (No. 1).

### ATLIN MINING DIVISION.

| Mine or Group. | Locality. | Owner or Agent. | Address. | Character of Ore. |
|---|---|---|---|---|
| Cherokee | Atlin | Atlin Silver-Lead Mines, Ltd. | Atlin | Silver, gold, lead. |
| Engineer | Atlin | Engineer Gold Mines, Ltd. | Engineer | Gold, silver. |

### SKEENA MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| Trixie (Patterson) | Porcher island | J. W. Woodworth | Refuge Bay | Gold, silver. |

### NASS RIVER MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| Esperanza | Kitsault river | P. Gordon | Box 235, Anyox | Silver, gold, lead. |
| Golskeish | Anyox | Granby Cons. M. S. & P. Co. | Anyox | Gold, silver. |
| Hidden Creek | Anyox | Granby Cons. M. S. & P. Co. | Anyox | Copper, silver, gold. |
| La Rose | Kitsault river | | Alice Arm | Silver, gold, lead. |
| Wolf | Kitsault river | J. Fiva | Alice Arm | Gold, silver. |

### PORTLAND CANAL MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| B.C. Bonanza | Salmon river | B.C. Bonanza Mines, Ltd. | Vancouver | Silver, gold. |
| B.C. Silver | Salmon river | B.C. Silver Mines, Ltd. | Premier | Silver, gold. |
| Big Missouri | Salmon river | Buena Vista Mining Co. | Vancouver | Silver, gold. |
| Dunwell | Glacier creek | Dunwell Mines, Ltd. | Stewart | Silver, gold lead, zinc. |
| Outsider | Portland canal | Granby Cons. M. S. & P. Co. | Anyox | Copper, gold. |
| Porter-Idaho | Glacier creek | Porter-Idaho Mining Co. | Stewart | Silver, lead, gold. |
| Premier | Cascade river | Premier Gold Mines, Ltd. | Premier | Gold, silver. |
| Silverado | Bear river | Silverado Mines, Ltd | Victoria | Silver, gold, lead. |
| Terminus | Bear river | Terminus Mines, Ltd. | Victoria | Silver, lead, zinc. |

## NORTH-EASTERN DISTRICT (No. 2).

### OMINECA MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| Harvey gr | Babine mountain | Gale & Lifton. | Smithers | Silver, gold, copper. |
| Henderson | Hudson Bay mountain | Duthie Mines, Ltd. | Smithers | Silver, lead, gold. |
| Little Joe | Babine mountain | | | Gold, silver, copper. |
| Silver Cup | 9-Mile mountain | Duke Mining Co. | Vancouver | Silver, lead, zinc. |
| Silver King | Babine mountain | | | Silver, gold, copper, lead, zinc. |

### CARIBOO MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| Pioneer | Buckley creek | | | Silver, lead, zinc. |
| Last Chance | Buckley creek | | | Silver, lead, zinc. |

## CENTRAL DISTRICT (No. 3).

### LILLOOET MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| Coronation | Cadwallader creek | Coronation Cons. Min. Co., Ltd. | Vancouver | Gold. |
| Pioneer | Cadwallader creek | David Sloan | Shalalth | Gold. |

### VERNON MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| Kelly | West Summerland | J. W. S. Logie | West Summerland | Silver, lead, zinc. |
| St. Paul | Lumby | Dr. O. Van Etter | New Westminster | Gold, silver, lead, zinc. |

### KAMLOOPS MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| Homestake | Adams lake | W. L. Bell | Box 341, Kamloops | Gold, silver, lead, zinc. |
| Iron Mask | Kamloops | A. Wallinder | Box 520, Kamloops | Gold, copper, silver. |

## CENTRAL DISTRICT (No. 3)—*Continued.*

### ASHCROFT MINING DIVISION.

| Mine or Group. | Locality. | Owner or Agent. | Address. | Character of Ore. |
|---|---|---|---|---|
| Independence | Lytton | D. J. Stewart | Lytton | Gold. |

## SOUTHERN DISTRICT (No. 4).

### GREENWOOD MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| Bell | Beaverdell | McIntosh & Lee | Beaverdell | Silver, gold, lead, zinc. |
| Bounty | Beaverdell | A. MacPhee | Beaverdell | Silver, lead. |
| Crescent | Greenwood | J. H. Duhamel | Greenwood | Silver, gold. |
| Elkhorn Fraction | Greenwood | R. D. McKenzie | Greenwood | Silver, zinc, lead. |
| Enterprise | Greenwood | E. A. Wanke | Box 611, Greenwood. | Silver, gold. |
| Gold Drop | Greenwood | Louis Bosshart | Greenwood | Gold, silver, lead. |
| Inyo-Ackworth | Beaverdell | Inyo-Ackworth Mines, Ltd | Vancouver | Silver, zinc, lead. |
| Jewel | Eholt | Geo. White | Greenwood | Gold, silver. |
| Providence | Greenwood | J. McDonell | Greenwood | Silver. |
| Rambler Fraction | Beaverdell | W. Rambo | Beaverdell | Silver, zinc, lead. |
| Revenge | Beaverdell | | | Silver, lead, zinc. |
| Sally | Beaverdell | Sally Mines, Ltd | Box 220, Penticton. | Silver, gold, lead, zinc. |
| Spotted Horse | Greenwood | Jubilee Mining Co. | Greenwood | Silver, lead, zinc. |
| Standard Fraction | Beaverdell | W. Rambo | Beaverdell | Silver, zinc, lead. |
| Tiger | Beaverdell | | | Silver, zinc, lead. |
| Wellington | Beaverdell | The Wellington Syndicate | Greenwood | Silver, gold, lead, zinc. |

### GRAND FORKS MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| Emma Bluebell | Eholt | W. W. Ludlow | Eholt | Silver, copper. |
| Lightning Peak | Lightning peak | W. A. Calder | Edgewood | Silver, lead, zinc. |

### OSOYOOS MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| Nickel Plate | Hedley | Hedley Gold Mining Co. | Hedley | Gold, silver, arsenic. |

### SIMILKAMEEN MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| Copper Mountain | Allenby | Granby Cons. M. S. & P. Co. | Allenby | Copper, silver, gold. |
| Eureka | Summit camp | Andy Jensen | Tulameen | Silver, zinc, lead. |
| Renfrew | Siwash creek | J. A. Lade | Vancouver | Silver, gold, lead. |

## EASTERN DISTRICT (No. 5).

### WINDERMERE MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| B.C. and Tilbury | Wilmer | H. E. Forster | Wilmer | Silver, lead, zinc. |
| Lead Queen | Frances creek | Dr. F. M. Simonds | Brisco | Silver, lead, zinc. |
| Paradise | Windermere | R. Randolph Bruce | W. H. Cleland, Invermere | Silver, zinc, lead. |

### FORT STEELE MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| Aurora | Moyie lake | A. H. Smith | Newgate | Silver, zinc, lead. |
| Guindon | Moyie | Guindon Mining & Milling Co. | Moyie | Silver, zinc, lead. |
| Red Eagle | Bull river | Patrick McGrath | Yahk | Silver, copper, zinc. |
| St. Eugene | Moyie | Consolidated M. & S. Co. | Moyie | Silver, gold, zinc, lead. |
| Sullivan | Kimberley | Consolidated M. & S. Co. | Kimberley | Silver, lead, zinc. |

### GOLDEN MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| Anderson, L. E. | Beavermouth | L. E. Anderson | | Gold. |
| Ruth-Vermont | Vermont creek | Capt. G. W. Edwards | Golden | Silver, gold, lead, zinc. |

## EASTERN DISTRICT (No. 5)—*Continued.*

### TRAIL CREEK MINING DIVISION.

| Mine or Group. | Locality. | Owner or Agent. | Address. | Character of Ore. |
|---|---|---|---|---|
| Centre Star and Le Roi | Rossland | Consolidated M. & S. Co. | Trail | Gold, silver, copper. |
| I.X.L. | Rossland | I.X.L. Gold Mining & M. Co. | Tacoma | Gold. |
| Midnight | Rossland | Martin Daily | Rossland | Gold, silver. |
| Velvet | Rossland | Velvet Rossland Mines, Ltd. | Northport, Wn. | Gold, silver, copper. |

### AINSWORTH MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| Banker | Ainsworth | H. Giegerich | Kaslo | Silver, lead, zinc. |
| Bluebell | Riondel | S. S. Fowler | Riondel | Silver, lead, zinc. |
| Caledonia | Kaslo creek | G. E. McCready | Zincton | Silver, zinc, lead. |
| Gibson (Daybreak) | Zwicky | Daybreak Mining Co., Ltd. | Portland, Ore. | Silver, lead, zinc. |
| Highland | Ainsworth | Consolidated M. & S. Co. | Trail | Silver, lead, zinc. |
| Lakeshore | Ainsworth | | | Silver, lead, zinc. |
| Lavina | Argenta | Ed. Nordman | Beaverdell | Silver, lead. |
| Metals Recovery | Kaslo creek | Metals Recovery, Ltd. | M. S. Davys, Kaslo | Silver, gold, zinc, lead. |
| Monte Christo | Kaslo creek | Wm. Myers and Geo. Johnston | Kaslo | Silver, lead, zinc. |
| Montezuma | Kaslo creek | H. Giegerich | Kaslo | Silver, zinc, lead. |
| Old Sampling Works | Kaslo | James Anderson | Kaslo | Silver, zinc, lead. |
| Patrick | Argenta | J. J. Brochier | Kaslo | Silver, lead, zinc. |
| Silver Hoard | Ainsworth | H. Giegerich | Kaslo | Silver, zinc, lead. |
| Whitewater | Whitewater | Whitewater Mines, Ltd. | Kaslo | Silver, gold, zinc, lead. |

### SLOCAN MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| Alamo | Alamo | Cunningham Mines, Ltd. | Sandon | Silver, zinc, lead. |
| American Boy | Carpenter creek | American Boy Mining Co. | Box 171, Sandon | Silver, lead, zinc. |
| Antoine | Sandon | Antoine Cons. Mines, Ltd. | Box 122, Kaslo | Silver, lead, zinc. |
| Bosun | Sandon | Rosebery-Surprise Mining Co. | New Denver | Silver, lead, zinc. |
| Canadian | Sandon | Joe Brandon | Silverton | Silver, lead, zinc. |
| Colonial | Sandon | H. E. Singel | Sandon | Silver, lead, zinc. |
| Dora | Three Forks | L. P. Gormley | Alamo | Silver, lead. |
| Fisher Maiden | Silverton | Manager | Silverton | Silver, zinc, lead. |
| Galena Farm | Silverton | Johnson & Mathews | Silverton | Silver, gold, zinc, lead. |
| Hewitt | Silverton | The Victoria Syndicate, Ltd. | Kaslo | Silver, zinc, lead. |
| Hidden Treasure | Sandon | | | Silver, lead, zinc. |
| Lucky Jim | Zincton | Lucky Jim Lead and Zinc Co. | Spokane | Silver, zinc, lead. |
| Mammoth | Silverton | Porcupine Goldfield Dev. & Finance Co., Ltd. | Kimberley | Silver, lead, zinc. |
| Metallic | Silverton | A. S. MacAulay | Silverton | Silver, zinc, lead. |
| Minnehaha and Carnation | Sandon | The Victoria Syndicate, Ltd. | Kaslo | Silver, lead. |
| Mollie Hughes | New Denver | E. J. Vandergrift | Sandon | Silver, zinc, lead. |
| Monitor | Three Forks | Rosebery-Surprise Mining Co. | New Denver | Silver, gold, lead, zinc. |
| Mountain Chief | Alamo | J. Cechelero | New Denver | Silver, zinc, lead. |
| Mountain Con | Carpenter creek | | | Silver, lead, zinc. |
| Noble Five | Cody | Paul Lincoln | Sandon | Silver, zinc, lead. |
| Oro | Sandon | | | Silver, lead, zinc. |
| Queen Bess | Alamo | Cunningham Mines, Ltd. | Sandon | Silver, lead, zinc. |
| Rambler-Cariboo | Rambler | Rambler-Cariboo Mines, Ltd. | New Denver | Silver, zinc, lead. |
| Red Fox | Sandon | | | Silver, lead, zinc. |
| Ruth-Hope | Sandon | Ruth-Hope Mines, Ltd. | Kaslo | Silver, lead, zinc. |
| Silversmith | Sandon | Silversmith Mines, Ltd. | Box 1772, Spokane | Silver, lead, zinc. |
| Standard | Silverton | Standard Silver Lead Co. | Silverton | Silver, zinc, lead. |
| Surprise | Sandon | Rosebery-Surprise Mining Co. | New Denver | Silver, zinc, lead. |
| Trade Dollar | Sandon | | | Silver, zinc, lead. |
| Van Roi | Silverton | Cunningham Mines, Ltd. | Sandon | Silver, zinc, lead. |
| Victor | Three Forks | Geo. Petty | Sandon | Silver, gold, lead, zinc. |
| Wonderful | Sandon | Cunningham Mines, Ltd. | Sandon | Silver, gold, zinc, lead. |

### SLOCAN CITY MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| Anna | Springer creek | K. E. Zimmerman | Slocan | Silver, lead, zinc. |
| Enterprise | Enterprise creek | E. C. Wragge and P. McGuire | Nelson | Silver, lead, zinc. |

### TROUT LAKE MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| True Fissure | Ferguson | | | Silver, zinc, lead. |

## EASTERN DISTRICT (No. 5)—*Continued.*

### NELSON MINING DIVISION.

| Mine or Group. | Locality. | Owner or Agent. | Address. | Character of Ore. |
|---|---|---|---|---|
| Alice | Creston | Guy Constable | Creston | Silver, lead, zinc. |
| Goodenough | Ymir | Goodenough Mines, Ltd. | Box 671, Nelson | Gold, silver, zinc, lead. |
| H.B. | Salmo | Consolidated M. & S. Co. | Trail | Silver, lead, zinc. |
| Hunter V. | Ymir | Consolidated M. & S. Co. | Trail | Gold, silver. |
| Kootenay Belle | Salmo | F. M. Black | Vancouver | Gold, silver. |
| Molly Gibson | Kitto Landing | Consolidated M. & S. Co. | Trail | Silver, lead, zinc. |
| Queen Victoria | Taghum | K. Scheer | Taghum | Copper, silver. |
| Silver Reef | Anderson creek | | | Silver, zinc, lead. |
| True Fissure | Rover creek | J. Desordie | Nelson | Silver, gold, zinc, lead. |
| Yankee Girl | Ymir | Yankee Girl, Ltd. | Ymir | Gold, silver, zinc, lead. |

### LARDEAU MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| Multiplex | Camborne | O. T. Bibb | Revelstoke | Silver, lead, zinc. |

### REVELSTOKE MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| Snowflake | Albert Canyon | Snowflake Mining Co., Ltd. | Vancouver | Silver, lead, zinc. |
| Woolsey | Albert Canyon | Bernier Metals Corp. | Vancouver. | Silver, lead, zinc. |

## WESTERN DISTRICT (No. 6).

### VANCOUVER MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| Britannia | Britannia Beach | Britannia M. & S. Co. | Britannia Beach | Copper, silver, gold. |

### NANAIMO MINING DIVISION.

| | | | | |
|---|---|---|---|---|
| Lucky Jim | Quadra island | R. Crowe-Swords | Vancouver | Silver, gold, copper. |

# LIST OF CROWN-GRANTED MINERAL CLAIMS.

## CROWN GRANTS ISSUED IN 1927.

### NORTH-WESTERN DISTRICT (No. 1).

| Claim. | Mining Division. | Grantee. | Lot. | Acres. | Date. |
|---|---|---|---|---|---|
| Alamo | Atlin | Engineer Gold Mines, Ltd. | 4669 | 45.46 | Aug. 15 |
| Anyox | " | " " | 4657 | 51.65 | Aug. 15 |
| Brownee No. 5 | " | Jessie Butterworth Kershaw | 4653 | 26.43 | Mar. 8 |
| Granby | " | Engineer Gold Mines, Ltd. | 4668 | 49.01 | Aug. 15 |
| Harley | " | Ben G. Nicoll | 4662 | 37.09 | Sept. 28 |
| Harley No. 1 | " | " | 4663 | 30.58 | Sept. 28 |
| Harley No. 2 | " | " | 4664 | 20.70 | Sept. 28 |
| Iron Mask | " | John Dunham | 4676 | 51.65 | Sept. 28 |
| Juanita | " | Engineer Gold Mines, Ltd. | 4654 | 50.35 | Aug. 15 |
| Monte Fraction | " | " " | 4667 | 5.32 | Aug. 15 |
| Pinto | " | " " | 4671 | 39.52 | Aug. 15 |
| Rodeo | " | " " | 4670 | 42.29 | Aug. 15 |
| Sweepstake No. 4 | " | Sweepstake Mining Corporation | 4672 | 45.11 | Mar. 8 |
| Sweepstake No. 5 Fr. | " | " " | 4673 | 40.29 | Mar. 8 |
| Sweepstake No. 6 Fr. | " | " " | 4674 | 24.25 | Mar. 8 |
| Wann Fr. No. 2 | " | Engineer Gold Mines, Ltd. | 4656 | 11.52 | Aug. 15 |
| Old Kentucky | Skeena | Frank Patterson | 6514R.5 | 51.65 | Sept. 3 |
| Trixie | " | " | 6515R.2 | 45.17 | Sept. 3 |
| Western Hope | " | " | 6516R.5 | 33.99 | Sept. 3 |
| Climax | Nass River | Olear Besner | 941 | 44.18 | May 20 |
| Climax No. 2 | " | " | 942 | 37.95 | May 20 |
| Eagle | " | Kitsault Eagle Silver Mines | 943 | 42.35 | Dec. 14 |
| Eagle No. 2 | " | " " | 944 | 51.65 | Dec. 14 |
| Eagle No. 3 | " | " " | 1386 | 51.65 | Dec. 14 |
| Eagle No. 4 | " | " " | 1387 | 35.79 | Dec. 14 |
| Eagle Fr. | " | " " | 1401 | 16.45 | Dec. 14 |
| Eagle No. 1 Fr | " | " " | 1402 | 5.25 | Dec. 14 |
| Homestake Fr. | " | Anne Davidson, Arthur F. Smith, and Gustav Pearson | 3979 | 2.27 | Jan. 6 |
| Homestake No. 1 | " | " " " " | 3980 | 11.62 | Jan. 6 |
| Silver Cord | " | Kitsault Eagle Silver Mines | 1389 | 35.62 | Dec. 14 |
| Albany | Portland Canal. | Robert Burns | 1820 | 22.75 | June 23 |
| Albany No. 2 | " | " | 1821 | 19.98 | June 23 |
| Albany No. 3 | " | P. Burns | 1823 | 13.53 | June 23 |
| Albany Fr. | " | " | 1825 | 8.46 | June 23 |
| Almo | " | Eldorado Gold Mines | 2847 | 29.41 | Mar. 19 |
| Almo Fr. | " | " " | 4445 | 44.82 | Mar. 19 |
| Bessie | " | George Gold Copper Mining Co. | 4777 | 51.65 | Oct. 28 |
| Betty No. 1 | " | American Mining and Milling Co. | 3447 | 51.65 | May 12 |
| Betty No. 2 | " | " " | 3448 | 49.81 | May 12 |
| Betty No. 3 | " | " " | 3449 | 46.05 | May 12 |
| Betty No. 4 | " | " " | 3450 | 51.65 | May 12 |
| Betty No. 5 | " | " " | 3451 | 51.65 | May 12 |
| Betty No. 6 | " | " " | 3452 | 51.65 | May 12 |
| Big Gulch | " | George Gold Copper Mining Co. | 4797 | 39.61 | Oct. 28 |
| Big Slide | " | " " | 4796 | 51.65 | Oct. 28 |
| Bluebird | " | Chas. Larson and Wm. H. Montgomery (administrator of the estate of Wm. Hamilton) | 4277 | 39.77 | Nov. 28 |
| BX No. 1 | " | Sebakwe and District Mines, Ltd. | 4427 | 51.65 | July 14 |
| BX No. 2 | " | " " | 4428 | 51.58 | July 14 |
| BX No. 3 | " | " " | 4429 | 51.65 | July 14 |
| BX No. 4 Fr. | " | " " | 4430 | 44.42 | July 14 |
| BX No. 5 Fr. | " | " " | 4431 | 32.29 | July 14 |
| BX No. 6 Fr. | " | " " | 4432 | 43.71 | July 14 |
| BX No. 7 Fr. | " | " " | 4433 | 36.43 | July 14 |
| BX No. 8 Fr. | " | " " | 4434 | 47.10 | July 14 |
| Canyon | " | George Gold Copper Mining Co. | 4798 | 51.65 | Oct. 28 |
| Castle Rock | " | " " | 4784 | 51.65 | Oct. 28 |
| Club Fraction | " | Douglas Robert Shewan | 4278 | 15.91 | Nov. 28 |
| Come Again | " | George Gold Copper Mining Co. | 4787 | 35.09 | Oct. 28 |
| Comet | " | Argenta Mines, Ltd. | 3418 | 48.54 | Oct. 1 |
| Comet No. 1 | " | " " | 3419 | 51.65 | Oct. 1 |
| Comet No. 2 | " | " " | 3420 | 31.20 | Oct. 1 |
| Comet No. 3 | " | " " | 3421 | 49.78 | Oct. 1 |
| Comet No. 4 | " | " " | 3422 | 51.63 | Oct. 1 |
| Copper King | " | George Gold Copper Mining Co. | 4780 | 37.60 | Oct. 28 |
| Copper King No. 1 | " | " " | 4790 | 49.82 | Oct. 28 |
| Copper King No. 2. | " | " " | 4791 | 43.80 | Oct. 28 |
| Copper Lord | " | " " | 4782 | 51.65 | Oct. 28 |
| Copper Queen | " | " " | 4781 | 51.65 | Oct. 28 |
| Copper Queen No. 1 | " | " " | 4788 | 46.13 | Oct. 28 |
| Copper Queen No. 2 | " | " " | 4792 | 51.65 | Oct. 28 |
| Creek | " | Radio Stewart Mines | 4570 | 51.61 | Oct. 28 |
| Double OO Fraction | " | Wm. Arthur Noble | 2844 | 17.91 | June 1 |
| Eleanor | " | George Gold Copper Mining Co. | 4783 | 51.65 | Oct. 28 |
| Eldorado No. 2 | " | Eldorado Gold Mines Cons., Ltd. | 4444 | 37.41 | Mar. 19 |
| Eldorado No. 3 | " | " " | 4443 | 38.24 | Mar. 19 |

NORTH-WESTERN DISTRICT (No. 1)—*Continued.*

| Claim. | Mining Division. | Grantee. | Lot. | Acres. | Date. |
|---|---|---|---|---|---|
| Exchange No. 1 | Portland Canal | Bush Mines, Ltd. | 1843 | 2.91 | Sept. 2 |
| Exchange No. 2 | " | " | 1844 | 10.49 | Sept. 2 |
| Exchange No. 3 | " | " | 1845 | 40.42 | Sept. 2 |
| Exchange No. 4 | " | " | 1846 | 20.99 | Sept. 2 |
| Exchange No. 5 | " | " | 1847 | 5.70 | Sept. 2 |
| Gold Crown | " | George Gold Copper Mining Co. | 4779 | 36.21 | Oct. 28 |
| Grand View | " | " " | 4793 | 51.65 | Oct. 28 |
| Grey Copper | " | Markus Pedersen | 4503 | 50.64 | Nov. 26 |
| High Ore No. 1 | " | Wm. Rounsefell Tonkin and John Carmen Eden | 4608 | 41.03 | Sept. 2 |
| High Ore No. 2 | " | " " " | 4609 | 51.44 | Sept. 2 |
| High Ore No. 3 | " | " " " | 4610 | 49.44 | Sept. 2 |
| High Ore No. 4 | " | " " " | 4611 | 49.44 | Sept. 2 |
| High Ore Fr | " | " " " | 4613 | 4.70 | Sept. 2 |
| High Ore No. 1. Fr | " | " " " | 4612 | 12.03 | Sept. 2 |
| Kid | " | George Gold Copper Mining Co. | 4799 | 44.19 | Oct. 28 |
| Kid Fr | " | " " | 4800 | 48.98 | Oct. 28 |
| Lucky Boy Fr | " | P. Burns | 1822 | 50.94 | June 23 |
| Mamie | " | George Gold Copper Mining Co. | 4778 | 51.65 | Oct. 28 |
| Maple Leaf No. 1 | " | Bush Mines, Ltd. | 4451 | 50.86 | Sept. 2 |
| Maple Leaf No. 2 | " | " | 4450 | 51.65 | Sept. 2 |
| Maple Leaf No. 3 | " | " | 4449 | 49.90 | Sept. 2 |
| Maple Leaf No. 4 | " | " | 4448 | 48.76 | Sept. 2 |
| Maple Leaf No. 5 | " | " | 4447 | 15.12 | Sept. 2 |
| McFadden | " | Owen McFadden, Angus McLeod, and Alex. N. McDonald | 4600 | 51.61 | July 21 |
| Nellie Fr | " | Wm. Rounsefell Tonkin and John Carmen Eden | 4614 | 50.88 | Sept. 2 |
| Raven | " | P. Burns | 1824 | 17.15 | June 23 |
| Red Bird No. 1 | " | George Gold Copper Mining Co. | 4794 | 51.65 | Oct. 28 |
| Red Bird Fr | " | " " | 4795 | 51.65 | Oct. 28 |
| Silver Bar No. 1 | " | J. J. Haahti, John Wardlaw Stewart, and Christian Wm. Frank | 1826 | 18.51 | Sept. 2 |
| Silver Bar No. 2 | " | Ditto | 1827 | 40.88 | Sept. 2 |
| Silver Bar No. 3 | " | " | 1828 | 41.34 | Sept. 2 |
| Single O | " | Wm. Arthur Noble | 2843 | 48.32 | June 1 |
| St. Eugene No. 3 | " | Albert Johnson | 4502 | 51.65 | Nov. 26 |
| Sunshine | " | Chas. Larson and Wm. Montgomery | 4194 | 51.65 | Sept. 12 |
| Triple OOO | " | Wm. Arthur Noble | 2845 | 30.01 | June 1 |
| Veteran | " | Argenta Mines, Ltd. | 3423 | 31.71 | Aug. 16 |
| Veteran No. 1 | " | " | 3424 | 31.71 | Aug. 16 |
| Veteran No. 2 | " | " | 3425 | 43.72 | Oct. 1 |
| Veteran No. 3 | " | " | 3426 | 51.65 | Oct. 1 |
| Waterfall | " | George Gold Copper Mining Co. | 4785 | 51.65 | Oct. 28 |
| Waterfall No. 1 | " | " " | 4789 | 31.63 | Oct. 28 |
| Whistler | " | " " | 4186 | 51.65 | Oct. 28 |
| Iron Duke Fr. | Queen Charlotte | Alex. Rogers | 2340 | 2.20 | Nov. 28 |

NORTH-EASTERN DISTRICT (No. 2).

| | | | | | |
|---|---|---|---|---|---|
| Alice | Cariboo | Alice E. Langton | 9939 | 28.91 | Jan. 13 |
| Avonlea | " | Anthony McClelland | 9602 | 51.57 | Jan. 13 |
| Portland | " | Eustace G. Hingley | 9941 | 51.65 | Jan. 13 |
| Rider | " | Clifford H. Rider | 9940 | 43.03 | Jan. 13 |
| Turnbull No 1 | " | Franklin W. Turnbull | 9938 | 18.88 | Jan. 13 |
| Turnbull No. 2 | " | Robt. E. Turnbull | 9943 | 38.91 | Jan. 13 |
| Annie D | Omineca | Thos. James Allen, E. E. Orchard, H. J. Kelly, and Geo. R. Wright | 3674 | 45.85 | Mar. 3 |
| Driftwood Creek | " | Ditto | 6779 | 36.69 | Mar. 3 |

CENTRAL DISTRICT (No 3).

| | | | | | |
|---|---|---|---|---|---|
| Snapper | Nicola | Edwin Tomlin and Fred C. Porter | 4087 | 38.46 | Nov. 4 |
| Buckhorn | Vernon | Ed. Jos. Saunders | 4860 | 35.01 | May 7 |
| Lora Bell | " | Laura M. Saunders | 4859 | 28.26 | May 7 |
| White Elephant | " | Archer P. Clark | 4880 | 40.01 | July 14 |
| Yellow Rose | " | Isabella Nancy Knight and John Summerville | 4881 | 39.04 | July 14 |
| Glossie Fr. | " | Melville Bryson and John Stuart Jamieson (trustees of the estate of John Wood, deceased), John Freemont Smith (administrator of estate of Archibald Decker, deceased, intestate), and Rose Burr | 4577 | 1.14 | Feb. 28 |
| Motherlode | Kamloops | M. Arnold | 3906 | 51.65 | Mar. 19 |

SOUTHERN DISTRICT (No. 4).

| | | | | | |
|---|---|---|---|---|---|
| Ella E | Greenwood | Ellen Hallett (executrix of the estate of Isaac Hoyt Hallett) | 2961 | 50.01 | July 6 |
| Kokomo Fr | " | Mark Wm. Smith | 3067s | 6.40 | May 12 |
| Annie | Grand Forks | Annie M. Boyce | 2397s | 46.90 | Oct. 12 |
| B.C. | " | Jos. Kloman | 13489 | 45.14 | May 20 |
| Hydro No. 1 | " | Annie M. Boyce | 2616s | 31.92 | Oct. 12 |
| Nellie No. 1 | " | " | 2396s | 50.36 | Oct. 12 |

SOUTHERN DISTRICT (No. 4)—*Continued.*

| Claim. | Mining Division. | Grantee. | Lot. | Acres. | Date. |
|---|---|---|---|---|---|
| U.S. | Grand Forks | Jos. Kloman | 13490 | 41.02 | May 20 |
| Ballarat | Osoyoos | Consolidated Mining and Smelting Co. of Canada, Ltd. | 3099s | 47.40 | Mar. 4 |
| Gypo | " | " " " " | 3098s | 39.41 | Mar. 8 |
| Alder | Similkameen | Granby Consolidated Mining, Smelting, and Power Co. | 2632s | 25.18 | Oct. 7 |
| Balsam Fr. | " | " " " " | 2633s | 33.83 | Oct. 7 |

EASTERN DISTRICT (No. 5).

| | | | | | |
|---|---|---|---|---|---|
| Blue Grouse | Windermere | J. L. McKay, Jessie May Alley, and Geo. Griffin Stapley | 11261 | 51.65 | Dec. 13 |
| Bohunk | " | " " " " | 11264 | 50.16 | Dec. 13 |
| Duchess | " | Jas. L. McKay | 11258 | 46.22 | May 18 |
| Last Chance | " | Jas. Lorenzo McKay, Jessie May Alley, and Geo. Griffin Stapley | 11262 | 48.93 | Dec. 13 |
| Oversight | " | Ditto | 11265 | 31.01 | Dec. 13 |
| Oversight Fr. | " | " | 11266 | 38.80 | Dec. 13 |
| Potlatch | " | Chas. Dallas Ellis and Wm. Lewis Kelly | 11436 | 51.65 | Nov. 28 |
| Premier Fr. | " | " " " | 11438 | 48.02 | Nov. 28 |
| Silver Cache | " | Jas. Lorenzo McKay, Jessie May Alley, and Geo. Griffin Stapley | 11263 | 47.38 | Dec. 13 |
| Toby Prince | " | Annie Elizabeth McKay | 11256 | 49.51 | May 18 |
| Toby Princess | " | Jas. L. McKay | 11257 | 51.65 | May 18 |
| Ag. | Fort Steele | Consolidated Mining and Smelting Co. of Canada, Ltd. | 13282 | 51.65 | Sept. 24 |
| Al. | " | " " " " | 13268 | 51.65 | Sept. 24 |
| Alpha No. 2 | " | R. H. Bennett | 13399 | 51.65 | Jan. 24 |
| Ark | " | Consolidated Mining and Smelting Co. of Canada, Ltd. | 13228 | 51.65 | Sept. 24 |
| As | " | " " " " | 13246 | 51.65 | Sept. 24 |
| Au | " | " " " " | 13283 | 51.65 | Sept. 24 |
| Babine | " | " " " " | 13370 | 51.65 | June 23 |
| Bay | " | " " " " | 13264 | 51.65 | Sept. 24 |
| B.C. | " | " " " " | 13229 | 51.65 | Sept. 24 |
| Bed | " | " " " " | 13290 | 51.65 | Dec. 1 |
| Bell | " | " " " " | 13252 | 51.65 | Sept. 24 |
| Bevan | " | " " " " | 13272 | 51.65 | Sept. 24 |
| Bi | " | " " " " | 13242 | 51.65 | Sept. 24 |
| Bill Nye | " | " " " " | 4829 | 51.65 | Nov. 15 |
| Black Crow | " | Edgar Home | 7807 | 51.65 | Jan. 4 |
| Board | " | Consolidated Mining and Smelting Co. of Canada, Ltd. | 13327 | 51.65 | Sept. 4 |
| Bobcat | " | " " " " | 9719 | 51.52 | June 14 |
| Bowl | " | " " " " | 13285 | 51.65 | Sept. 24 |
| Ca | " | " " " " | 13267 | 51.65 | Sept. 24 |
| Cabin | " | " " " " | 13326 | 51.65 | Dec. 1 |
| Calf | " | " " " " | 13231 | 51.65 | Sept. 24 |
| Car | " | " " " " | 13329 | 51.65 | Dec. 1 |
| Caribou | " | " " " " | 13351 | 51.09 | June 23 |
| Cart | " | " " " " | 13332 | 50.84 | Dec. 1 |
| Cassiar Fr. | " | " " " " | 13361 | 51.65 | June 23 |
| Cedar | " | " " " " | 13357 | 51.65 | June 23 |
| Chance No. 5 | " | R. H. Bennett | 13393 | 51.65 | Jan. 24 |
| Chance No. 6 | " | " | 13388 | 51.65 | Jan. 24 |
| Chance No. 7 | " | " | 13394 | 51.65 | Jan. 24 |
| Chance No. 8 | " | " | 13387 | 51.65 | Jan. 24 |
| Chase | " | Consolidated Mining and Smelting Co. of Canada, Ltd. | 13308 | 51.65 | Jan. 8 |
| Chilko | " | " " " " | 13373 | 51.65 | June 23 |
| Cl. | " | " " " " | 13240 | 51.65 | Sept. 24 |
| Clover Fr. | " | " " " " | 13315 | 21.84 | Dec. 1 |
| Club | " | " " " " | 13275 | 51.65 | Sept. 24 |
| Co. | " | " " " " | 13241 | 51.65 | Sept. 24 |
| Cow | " | " " " " | 13232 | 51.65 | Sept. 24 |
| Creston | " | " " " " | 13254 | 51.65 | Sept. 24 |
| Cu. | " | " " " " | 13266 | 51.65 | Sept. 24 |
| Daisy Fr. | " | " " " " | 13288 | 24.51 | Sept. 24 |
| Damsite Fr. | " | " " " " | 13262 | 51.64 | June 23 |
| Dawes | " | " " " " | 13324 | 50.20 | Dec. 1 |
| Dawson Fr. | " | " " " " | 13374 | 48.70 | June 23 |
| Don | " | " " " " | 13259 | 51.65 | Sept. 24 |
| Duck | " | " " " " | 13244 | 51.65 | Sept. 24 |
| Eastern | " | " " " " | 13376 | 46.65 | June 23 |
| Eden | " | " " " " | 13227 | 51.65 | Sept. 24 |
| Erasmus | " | " " " " | 13372 | 51.65 | June 23 |
| Face | " | " " " " | 13280 | 51.65 | Sept. 24 |
| Fe | " | " " " " | 13260 | 51.65 | Sept. 24 |
| Find | " | " " " " | 13249 | 51.65 | Sept. 24 |
| Findlay | " | " " " " | 13348 | 51.65 | June 23 |
| Flivver | " | " " " " | 13330 | 51.65 | Dec. 1 |
| Flood | " | " " " " | 13224 | 51.65 | Sept. 24 |
| Flower | " | " " " " | 13311 | 51.61 | Dec. 1 |
| Foul | " | " " " " | 13333 | 51.65 | Dec. 1 |
| Gain | " | " " " " | 13235 | 51.65 | Sept. 24 |
| Gauge | " | " " " " | 13276 | 51.65 | Sept. 24 |
| Good Hope | " | " " " " | 13526 | 51.65 | Oct. 14 |
| Goose | " | " " " " | 13245 | 51.65 | Sept. 24 |
| Grass Fr. | " | " " " " | 13313 | 20.71 | Dec. 1 |
| Harriet | " | " " " " | 13274 | 51.65 | Sept. 24 |
| Harry | " | " " " " | 13271 | 51.65 | Sept. 24 |

EASTERN DISTRICT (No. 5)—*Continued.*

| Claim. | Mining Division. | Grantee. | Lot. | Acres. | Date. |
|---|---|---|---|---|---|
| Hendy | Fort Steele | Consolidated Mining and Smelting Co. of Canada, Ltd. | 13354 | 51.65 | June 23 |
| Hg | " | " " " " | 13270 | 51.65 | Sept. 24 |
| Hole | " | " " " " | 13328 | 51.65 | Jan. 8 |
| Home | " | " " " " | 13334 | 51.65 | Dec. 1 |
| Hot | " | " " " " | 13247 | 51.65 | Sept. 24 |
| House | " | " " " " | 13327 | 51.65 | Dec. 1 |
| Hunt | " | " " " " | 13250 | 51.65 | Sept. 24 |
| Huxley Fr. | " | " " " " | 13369 | 29.15 | June 23 |
| Ian | " | " " " " | 13356 | 51.65 | June 23 |
| Joe | " | " " " " | 13253 | 51.65 | Sept. 24 |
| John D. | " | " " " " | 13827 | 21.10 | Dec. 14 |
| Jupiter Fr. | " | " " " " | 13359 | 22.86 | June 23 |
| Justrite | " | " " " " | 13594 | 51.65 | June 23 |
| Kay | " | " " " " | 13286 | 51.65 | Sept. 24 |
| Kent | " | " " " " | 13278 | 51.65 | Sept. 24 |
| King | " | " " " " | 13336 | 51.65 | Dec. 1 |
| Larch | " | " " " " | 13353 | 51.65 | June 23 |
| Liard | " | " " " " | 13345 | 51.65 | Jan. 6 |
| Lister | " | " " " " | 13251 | 51.65 | Sept. 24 |
| Log | " | " " " " | 13323 | 51.65 | Dec. 1 |
| Mars | " | " " " " | 13360 | 51.17 | June 23 |
| Martha | " | " " " " | 13364 | 51.65 | June 23 |
| Master | " | " " " " | 13365 | 51.65 | June 23 |
| Moon | " | " " " " | 13366 | 51.65 | June 23 |
| Na | " | " " " " | 13239 | 51.65 | Sept. 24 |
| N.E | " | " " " " | 13317 | 51.48 | Dec. 1 |
| Ni | " | " " " " | 13257 | 51.65 | Sept. 24 |
| Nick | " | " " " " | 13347 | 51.65 | June 23 |
| Noah | " | " " " " | 13225 | 51.65 | Sept. 24 |
| Ore | " | " " " " | 13258 | 51.65 | Sept. 24 |
| Pb. | " | " " " " | 13263 | 51.65 | Sept. 24 |
| Peele | " | " " " " | 13273 | 51.65 | Sept. 24 |
| Petal Fr. | " | " " " " | 13312 | 24.43 | Dec. 1 |
| Pete Fr. | " | " " " " | 13368 | 29.92 | June 23 |
| Pig | " | " " " " | 13233 | 51.65 | Sept. 24 |
| Plan | " | " " " " | 13325 | 50.52 | Dec. 1 |
| Plate | " | " " " " | 13335 | 51.65 | Dec. 1 |
| Plus | " | " " " " | 13318 | 51.65 | Dec. 1 |
| Pollox | " | " " " " | 13182 | 46.91 | April 11 |
| Price Fr. | " | " " " " | 13363 | 51.65 | June 23 |
| Prune Fr | " | " " " " | 13181 | 51.65 | April 11 |
| Pt. | " | " " " " | 13265 | 51.65 | Sept. 24 |
| Rockcliff | " | Edgar Home | 7808 | 49.43 | Jan. 6 |
| Rose | " | Consolidated Mining and Smelting Co. of Canada, Ltd. | 13291 | 51.65 | Dec. 1 |
| Run | " | " " " " | 13339 | 51.65 | Dec. 1 |
| Sack | " | " " " " | 13338 | 51.65 | Dec. 1 |
| Satura | " | " " " " | 13371 | 51.65 | June 23 |
| Sharp | " | " " " " | 13248 | 51.65 | Sept. 24 |
| Sheep | " | " " " " | 13234 | 51.65 | Sept. 24 |
| Shoot | " | " " " " | 13255 | 51.65 | Sept. 24 |
| Si | " | " " " " | 13256 | 51.65 | Sept. 24 |
| Skin | " | " " " " | 13230 | 51.65 | Sept. 24 |
| Sn. | " | " " " " | 13269 | 51.65 | Sept. 24 |
| Sol. | " | " " " " | 13236 | 51.65 | Sept. 24 |
| Sow | " | " " " " | 13262 | 51.65 | Sept. 24 |
| Spencer | " | " " " " | 13352 | 51.65 | June 23 |
| Spider Fr. | " | " " " " | 13183 | 14.08 | April 11 |
| Spoke | " | " " " " | 13298 | 51.65 | Sept. 24 |
| Square | " | " " " " | 13355 | 51.65 | June 23 |
| Sr. | " | " " " " | 13243 | 51.65 | Sept. 24 |
| Star | " | " " " " | 13367 | 51.65 | June 23 |
| Star No. 5 | " | R. H. Bennett | 13381 | 51.65 | Jan. 24 |
| Star No. 6 | " | " | 13422 | 51.65 | Jan. 24 |
| Star No. 8 | " | " | 13423 | 51.65 | Jan. 24 |
| Stick | " | Consolidated Mining and Smelting Co. of Canada, Ltd. | 13340 | 51.48 | Dec. 1 |
| Sun | " | " " " " | 13377 | 26.89 | June 23 |
| Sunny | " | " " " " | 13279 | 51.65 | Sept. 24 |
| Test | " | " " " " | 13300 | 51.65 | Sept. 24 |
| Tip | " | " " " " | 13322 | 51.65 | Dec. 1 |
| Toodle | " | " " " " | 13319 | 51.65 | Dec. 1 |
| Tub | " | " " " " | 13337 | 51.65 | Dec. 1 |
| Tube | " | " " " " | 13299 | 51.65 | Sept. 24 |
| Tyndal Fr. | " | " " " " | 13358 | 51.62 | June 23 |
| Vase | " | " " " " | 13287 | 35.62 | Sept. 24 |
| Waggon | " | " " " " | 13331 | 51.65 | Dec. 1 |
| Walk | " | " " " " | 13238 | 51.65 | Sept. 24 |
| Warren Fr. | " | " " " " | 13375 | 47.20 | June 23 |
| Wolf | " | " " " " | 11000 | 19.56 | April 11 |
| Yale | " | " " " " | 13284 | 51.65 | Sept. 24 |
| York | " | " " " " | 13277 | 51.65 | Sept. 24 |
| Zip | " | " " " " | 13314 | 51.65 | Dec. 1 |
| Zn. | " | " " " " | 13261 | 51.65 | Sept. 24 |
| Zoom Gr. | " | " " " " | 13289 | 43.65 | Dec. 1 |
| A.Y. | Ainsworth | Slocan Consolidated Silver Mines | 2272 | 34.54 | Nov. 28 |
| Crown Point | " | Henry Howell Armstead | 13474 | 51.65 | April 25 |
| Kootenay Belle | " | " " | 13475 | 49.91 | April 25 |
| Florence | Slocan City | Robt. Geo. Henderson | 10685 | 51.65 | Nov. 26 |

EASTERN DISTRICT (No. 5)—*Continued.*

| Claim. | Mining Division. | Grantee. | Lot. | Acres. | Date. |
|---|---|---|---|---|---|
| Ioa | Slocan City | Robt. Geo. Henderson | 10684 | 51.65 | Nov. 26 |
| Bon Ton | " | C. P. Hill | 9720 | 51.09 | June 14 |
| Jolly Boy | Nelson | " | 9718 | 46.38 | June 14 |
| Klondyke No. 1 Fr. | " | Wm. Thom. McDowell | 13485 | 0.44 | July 14 |
| Kootenay Warrior | " | C. P. Hill | 9722 | 49.89 | June 14 |
| Lucky Boy | " | August Schwinke | 9188 | 39.63 | Mar. 8 |
| Lucky Boy Fr. | " | " " | 10822 | 40.11 | Mar. 8 |
| Midnight Fr. | " | Michael Murphy | 13476 | 28.08 | Oct. 21 |
| Old Chief | " | C. P. Hill | 9721 | 41.69 | June 14 |
| Vermilion | " | " | 9723 | 50.41 | June 14 |
| Providence Superior Fr. | Lardeau | Emma T. Blockberger | 9129 | 2.50 | Oct. 12 |
| Reliance | " | " " | 9130 | 24.74 | Oct. 12 |
| Blue Jay | Trout Lake | Adolph Brachat, Ernest Cottle, Sam. Stanley, Pat. Comerford, Chas. Richards, and Jas. Tait | 13482 | 46.08 | Nov. 29 |
| Boston | " | A. B. Trites | 5326 | 44.07 | Mar. 2 |
| Chicago | " | " | 5327 | 37.71 | Mar. 2 |
| Copper Glance | " | Adolph Brachat, Ernest Cottle, Sam. Stanley, Pat. Comerford, Chas. Richards, and Jas. Tait | 13483 | 42.95 | Nov. 29 |
| Gladstone | " | Ditto | 13480 | 39.17 | Nov. 29 |
| Joker | " | " | 13478 | 32.45 | Nov. 29 |
| Jutland | " | " | 13484 | 37.56 | Nov. 29 |
| Mt. View | " | " | 13477 | 49.84 | Nov. 29 |
| Snowstorm | " | " | 13481 | 31.18 | Nov. 29 |
| Victoria | " | " | 13479 | 21.31 | Nov. 29 |

WESTERN DISTRICT (No. 6).

| | | | | | |
|---|---|---|---|---|---|
| Lady Evelyn | Nanaimo | R. H. Schwarzkoff | 159 | 35.06 | Jan. 6 |
| Lady Helen | " | " " | 157 | 48.19 | Jan. 6 |
| Pearl | " | C. M. Oliver | 5563 | 35.06 | Oct. 5 |
| Sir Chet | " | R. H. Schwarzkoff | 156 | 39.81 | Jan. 6 |
| Sir Ned | " | " " | 158 | 42.86 | Jan. 6 |
| Bluebell | Quatsino | R. A. Grierson | 1296 | 51.63 | April 27 |
| Caledonian | " | T. B. Harris | 1294 | 47.48 | April 27 |
| Cascade | " | Louise K. Potts | 1295 | 49.33 | April 27 |
| British | Vancouver | Saul Medici | 4357 | 51.65 | Mar. 8 |
| Canada | " | " | 4358 | 51.65 | Mar. 8 |
| Min | " | Basil G. Hawkins | 2157 | 51.65 | Feb. 16 |
| Black Rock | New Westm'r | Mark Frank Topham | 590 | 36.74 | Nov. 23 |

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